AF-1
$3.95

KODAK Films

COLOR & BLACK-AND-WHITE

A PHOTO BOOK FROM KODAK

Modern photographic films are truly remarkable when you consider how effectively they record the events of our lives. The uses of film in our society are almost endless. Because film is such a vital part of the photographic process and so profoundly affects the quality of your pictures, you need a film that gives results of consistently high quality. Kodak films meet these requirements.

Kodak films are manufactured with a wide variety of characteristics so that you can choose the best film for the type of photographs you want to take. In order for you to select the best film to suit your needs, you should be familiar with the characteristics of the films available. The purpose of this book is to acquaint you with Kodak films for general use.

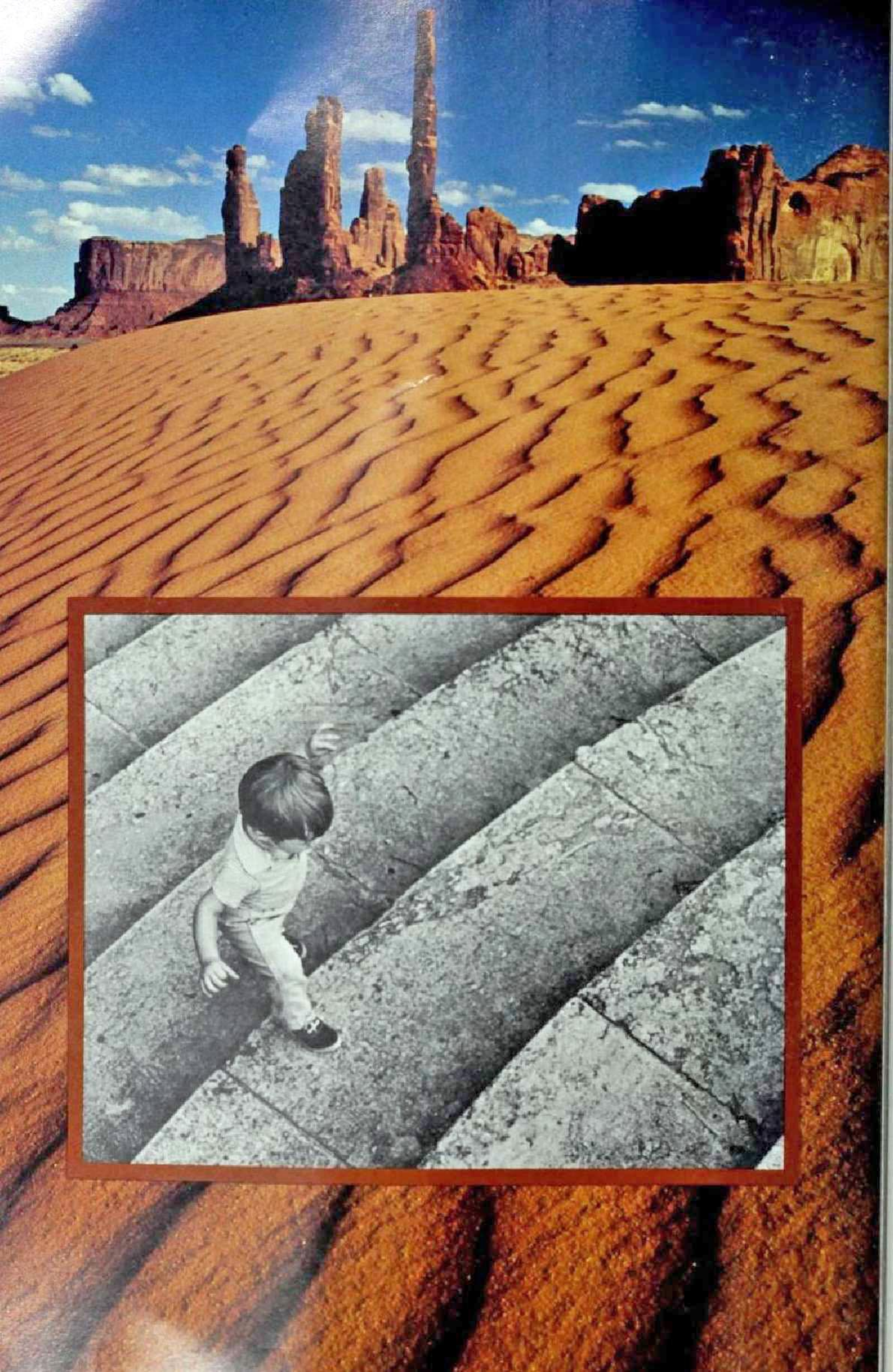
The book has two sections—a text portion and a section of Data Sheets at the end of the book. The text portion explains what you'll want to know about selecting the right film, how to expose it properly, how to get it processed, and how you should store your films. The Data Sheet section gives you all the details for each film, such as film speeds, recommended filters, flash exposure guide numbers, and processing requirements. The information presented in this book will help you make photographs that you will be proud to show to your friends.

For data books on professional roll and sheet films, you may want to purchase *KODAK Color Films for Professional Use* (E-77) and *KODAK Professional Black-and-White Films* (F-5). These books are available at stores that sell photographic products and at bookstores (see inside back cover). In most foreign countries Kodak books are sold mainly in bookstores.

Caroline Grimes, *Editor*

Picture on front cover
JIM DENNIS

ESTHER HENDERSON



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Desert picture—DAVID MUENCH/H. A. ROBERTS

Picture of boy on steps—HOWARD M. BESOSA, KINSA*

*Courtesy Kodak International Newspaper Snapshot Awards.

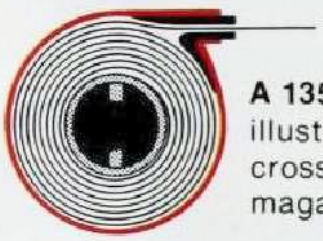
DON MAGGIO

Choosing a Film

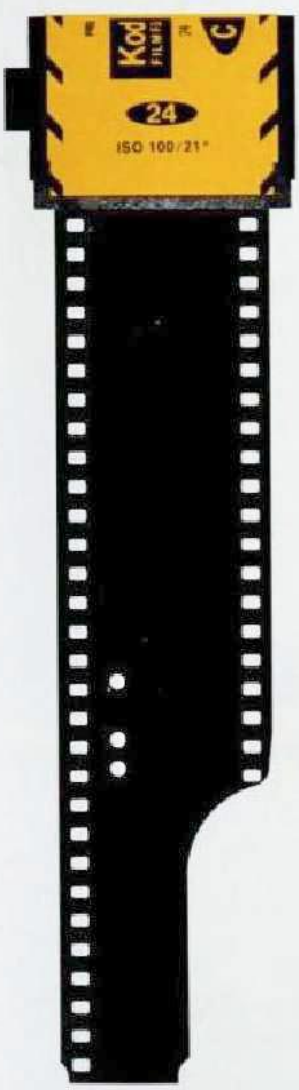
Your first consideration in selecting a film is the kind of camera you have—conventional or instant. If you have one of the KODAK Instant Cameras, Kodak makes an instant color film for use in these cameras which gives you instant color prints. If you have a conventional camera, your next consideration is the type of pictures you want—color prints, color slides, or black-and-white prints. Kodak makes several films with different characteristics for each type of picture for use in conventional cameras. The information in this book will help you select the best film for your needs.

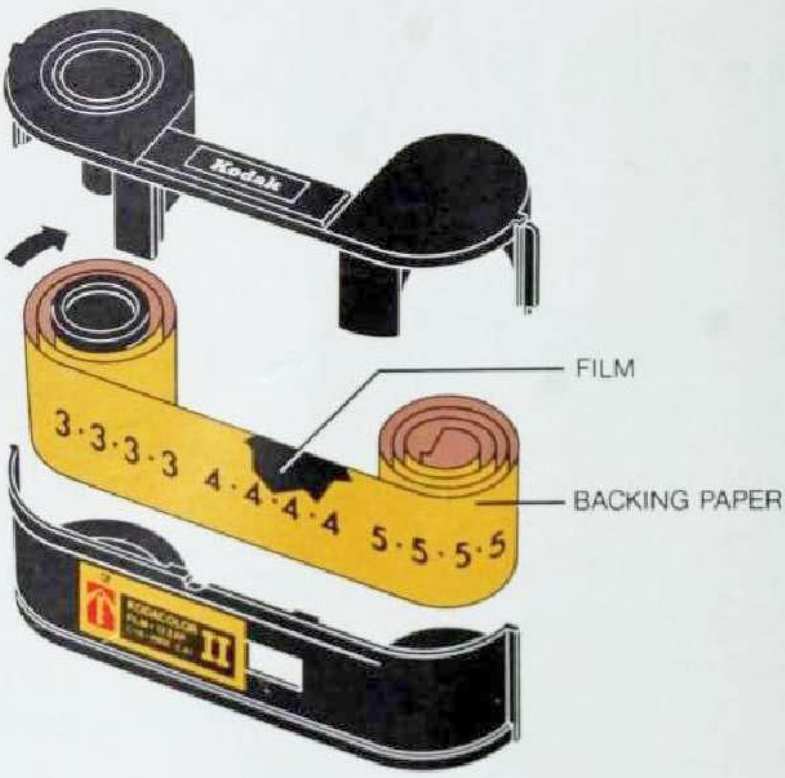
You'll also want to know what films are available in the size that your camera accepts. Kodak films for general use are manufactured in four general forms—135 magazines, 110 and 126 cartridges, rolls, and PR144 instant film packs.

The 135 films are rolled on spools in magazines. These films are 35 mm wide and have no backing paper. They are available in 12-, 20-, 24-, or 36-exposure lengths, depending on the kind of film.

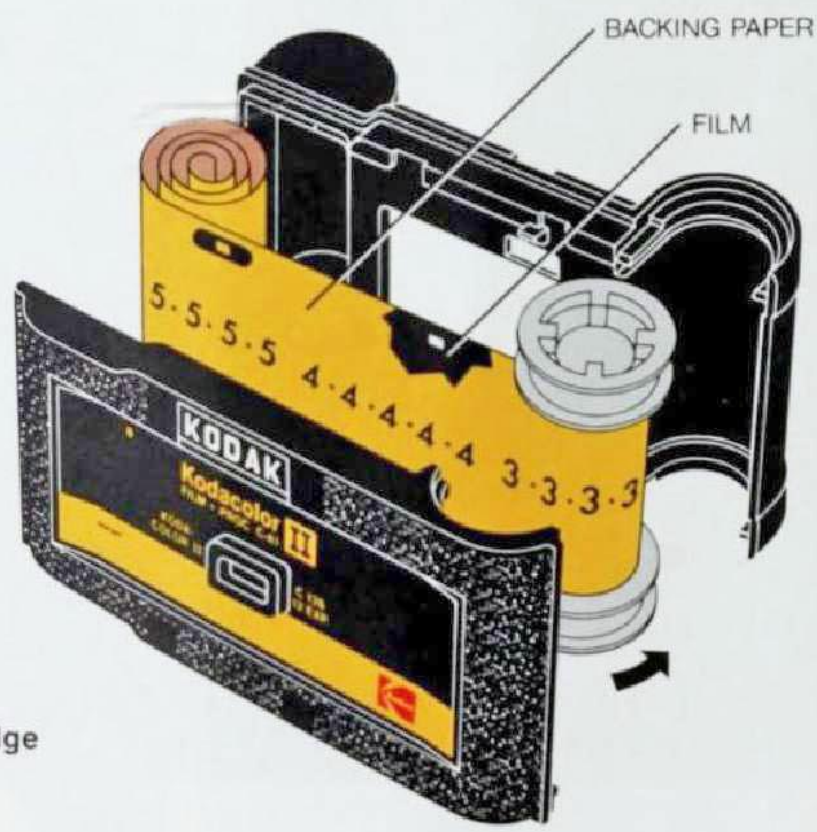


A 135 magazine. The illustration on the left is a cross-section view of a magazine loaded with film.





110 Cartridge



126 Cartridge

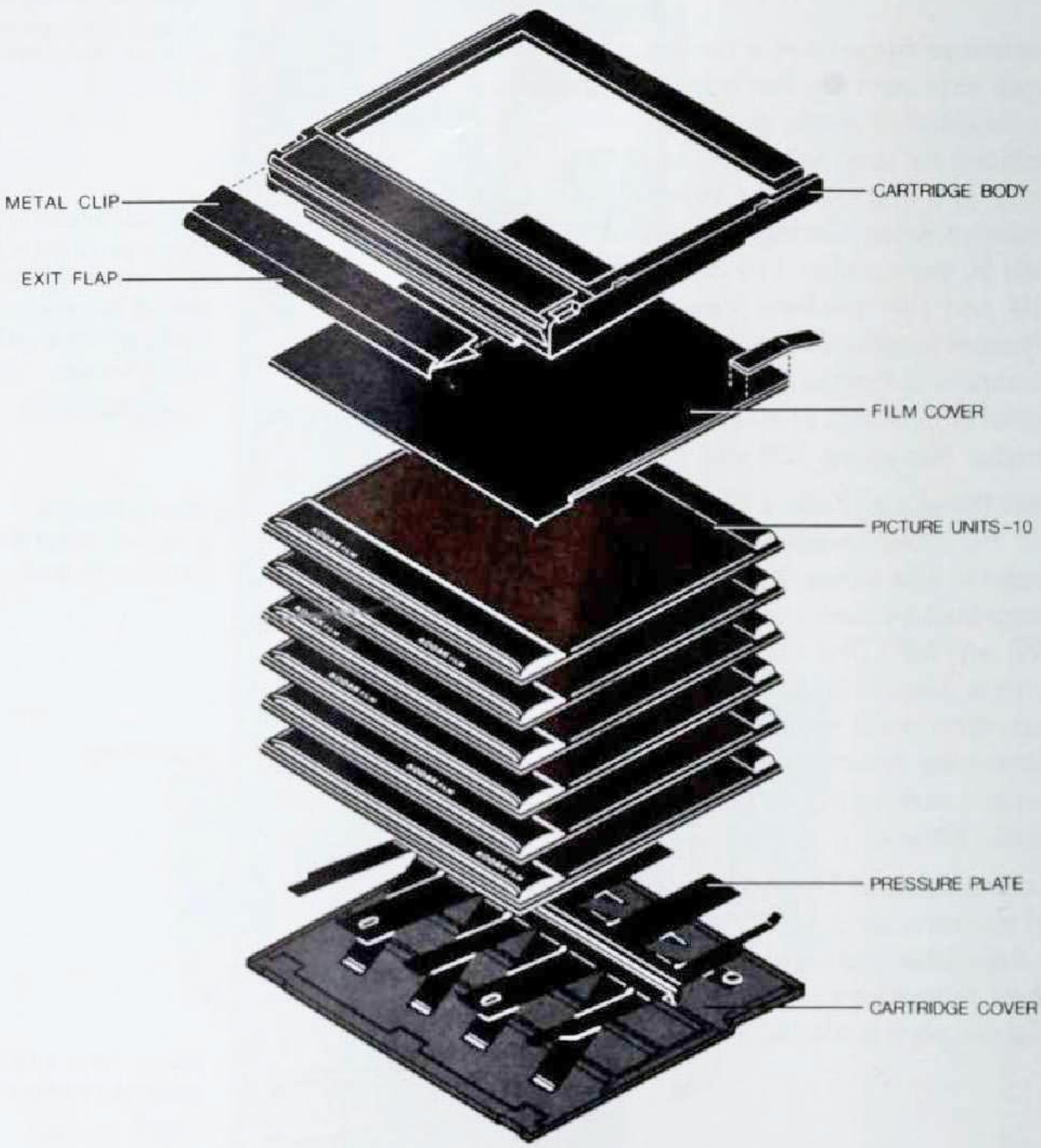
An inside view of a 110 and a 126 film cartridge. Do not break open the cartridge unless you process the film yourself. Otherwise the film will be ruined by light-fogging.

Cartridge films have a backing paper to protect the film from light and are supplied in plastic cartridges designed for drop-in loading of KODAK EKTRA and INSTAMATIC® Cameras and similar cameras. Cartridge film is identified by the number 110 or 126. Some 110- and 126-size films come in 12-exposure lengths, others come in 20- or 24-exposure lengths, and some are available in both 12- and 24-exposure lengths. See pages 128 and 129.

Roll films also have a backing paper and are rolled on spools. They are available in a variety of sizes and are designated by such numbers as 120, 127, and 620. The number of exposures is determined by the camera format; there are 8 to 16 exposures for rectangular pictures, depending on the camera, and usually 12 exposures for square pictures.

KODAK Instant Film packs each hold 10 instant color picture units. The pack is disposable plastic and includes a film cover to protect the film from light before the pack is loaded in the camera.

End is shaped to fit slot in film spool.
Black paper leader (longer than shown) protects film from light.
Edge of backing paper on most sizes of Kodak roll film is skived to make lighttight seal with spool flange.
Start of film is attached to backing paper with tape.
Roll Films
End of film is not attached to backing paper.
Black paper trailer (longer than shown) protects film from light.



An exploded view of a **KODAK Instant Film Pack PR144-10**

NEIL MONTANUS

KODACHROME 64 Film (Daylight)

To choose a color film, you'll want to know, in addition to the kind of pictures it makes and the film sizes available, the film speed and the light sources recommended for the film. Also, you'll want to have some idea of the color quality and the definition (see page 51) of the pictures it produces. If you do your own darkroom work, you'll want to know if you can process the film yourself.

To choose a black-and-white film is simpler than selecting a color film. Unless you need one of the few films particularly designed for special purposes, the main considerations for general-use black-and-white films are film speed and the quality of definition you'll get in your pictures. Definition is explained on page 72.

Nonadjustable cameras and some basic automatic cameras will not expose high-speed films correctly. See your camera manual for the films recommended for these cameras.

PAUL A. GREENBERG

KODAK TRI-X Pan Film

CHOOSING A FILM

Each kind of Kodak film is designed primarily to produce only one of these four kinds of pictures. Most film cartons tell you the kind of pictures that particular film makes. For the sizes available in each kind of Kodak film, see pages 128 and 129. Processing services are available so that you can also obtain other kinds of pictures from your negatives, slides, or prints. See page 55.

KODACOLOR II and **KODACOLOR 400 Films** are for COLOR PRINTS.

Color Negative

DON MAGGIO

Color Print

KODACHROME 25, 40, and **64 Films,** and **KODAK EKTACHROME 64, 160, 200,** and **400 Films** are for COLOR SLIDES.

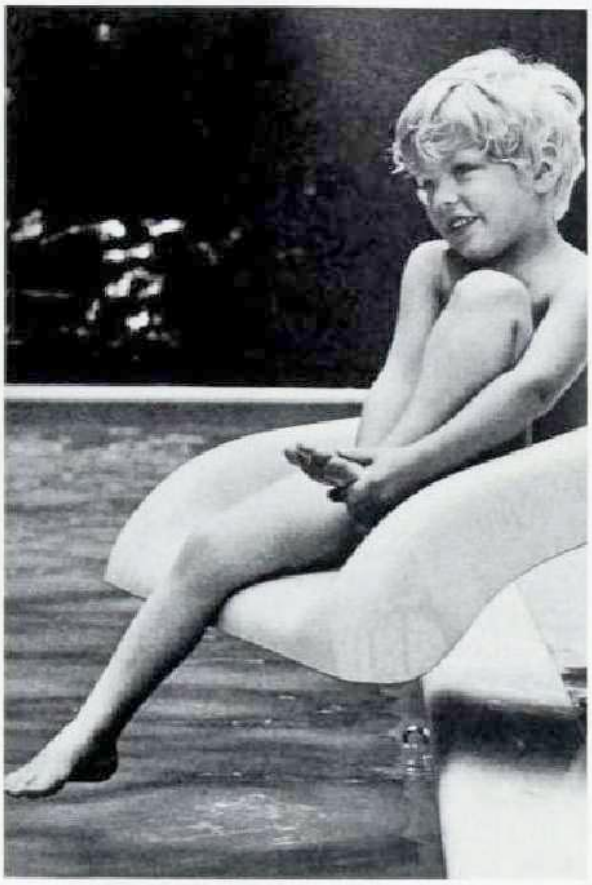
BOB CLEMENS

Color Slide

JOY C. BUTZ, KINSA

KODAK VERICHROME Pan, PLUS-X Pan, PANATOMIC-X, and **TRI-X Pan Films** are for BLACK-AND-WHITE PRINTS. Other black-and-white films for special purposes are described on page 69.

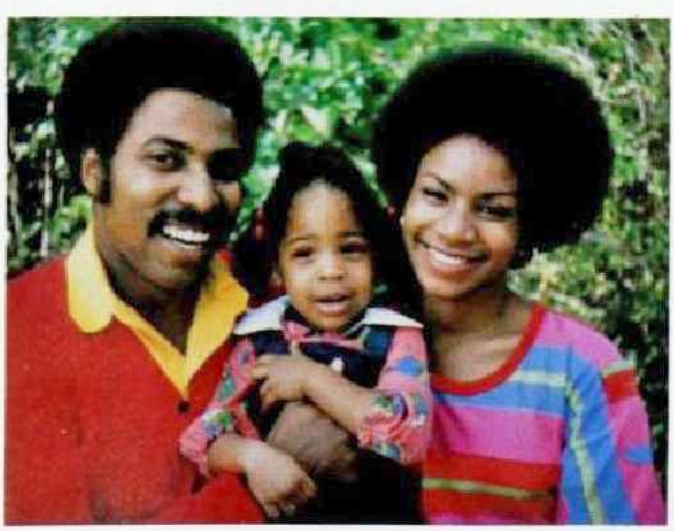
Black-and-White Negative



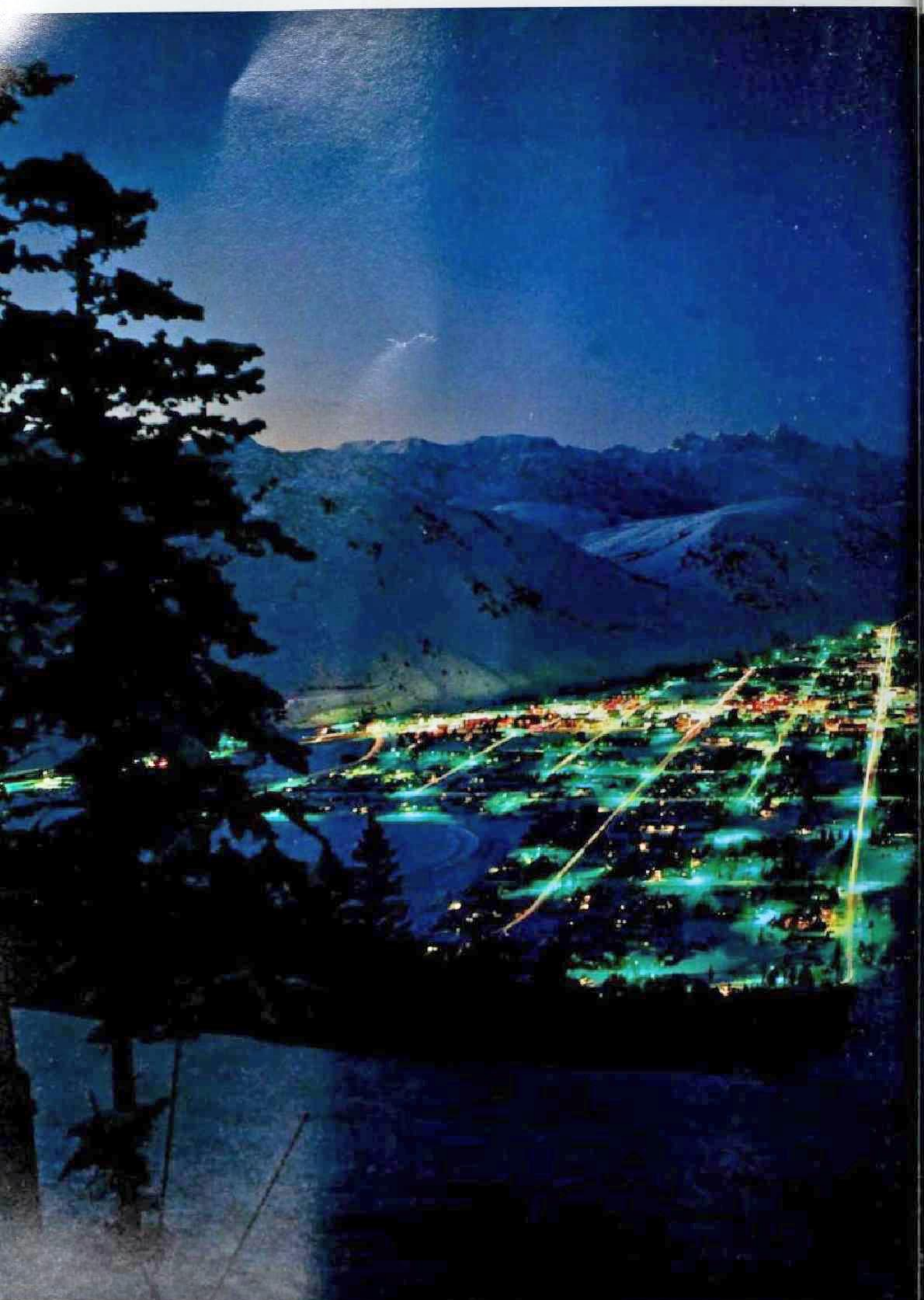
Black-and-White Print

TOM MC CARTHY

KODAK Instant Color Film PR144-10 is for INSTANT COLOR PRINTS.



Color Print



NEIL MONTANUS

Kodak Color Films

Color films for still cameras are available in three general kinds. One kind produces color negatives which are primarily used to make color prints; another kind of film produces color slides; and the third kind produces instant color prints.

In color negatives, all the tones and colors of the original scene are reversed: Light tones are recorded dark, dark tones are recorded light, and the colors are the complements of the colors you saw when you took the picture. Kodak color-negative films have built-in masks that help improve the quality of prints made from them. These masks give the negatives an overall color cast of light orange-tan. All the color relationships are properly reproduced when the negatives are printed on color photographic paper. You can also have color slides made from your color negatives; see "Getting Prints or Slides Made—from Your Negatives, Prints, or Slides" on page 55.

The second kind of color film gives you color slides directly. During processing, the image on the film is reversed from a negative to a positive, resulting in a color slide or transparency that you can either project onto a screen or look at with a viewer. The same film that was exposed in your camera is processed, mounted, and returned to you as slides (or as unmounted transparencies if you prefer). You can order prints

While the interesting colors of twilight last only a few moments, a picture taken on color film will preserve a visual experience that would be only a fleeting memory. Jackson Hole, Wyoming.

or duplicate slides from your slides or transparencies; see page 55.

The third kind of color film, instant color film for use in instant cameras, produces finished color prints in a matter of minutes. There is no usable negative. You can have additional color prints or color slides made from both instant and conventional, finished original color prints.

Kodak color-negative films and Kodak color-slide films are both available in films designed for general use and in films designed for professional use. The films for general use are manufactured for the needs of photographers who take pictures for recreation, such as photohobbyists and people who take only casual snapshots. These photographers may have the film in their cameras for longer periods of time at varying temperatures and may have longer delays before the film is processed than professionals. Casual photographers usually buy film in smaller amounts, therefore storage conditions are not as much of a factor as for the professional photographer. General-use films produce excellent quality when these conditions are not extreme. See the section on storage of Kodak films beginning on page 111.

Kodak color films for professional use have "professional" or "commercial" in their names. Professional films are made for the needs and working habits of professional photographers. Professionals require greater precision for commercial photography, normally process their film soon after taking the pictures, and usually purchase film in large quantities. To achieve this precision and meet these needs, professional films require refrigerated storage, prompt exposure, and prompt processing.

Therefore, the most important difference for the nonprofessional photographer between films for general use and those for professional use is the more rigid requirements for storing and handling professional films.

You'll find a comprehensive table of condensed information for Kodak color films on page 128.

FILMS FOR COLOR PRINTS

There are two Kodak color-negative films for general use in conventional cameras that are for color prints—a fast, general-purpose film and a high-speed film. Some simple cameras are not designed for use with high-speed films. See the discussion in the section on "Exposure" beginning on page 87.

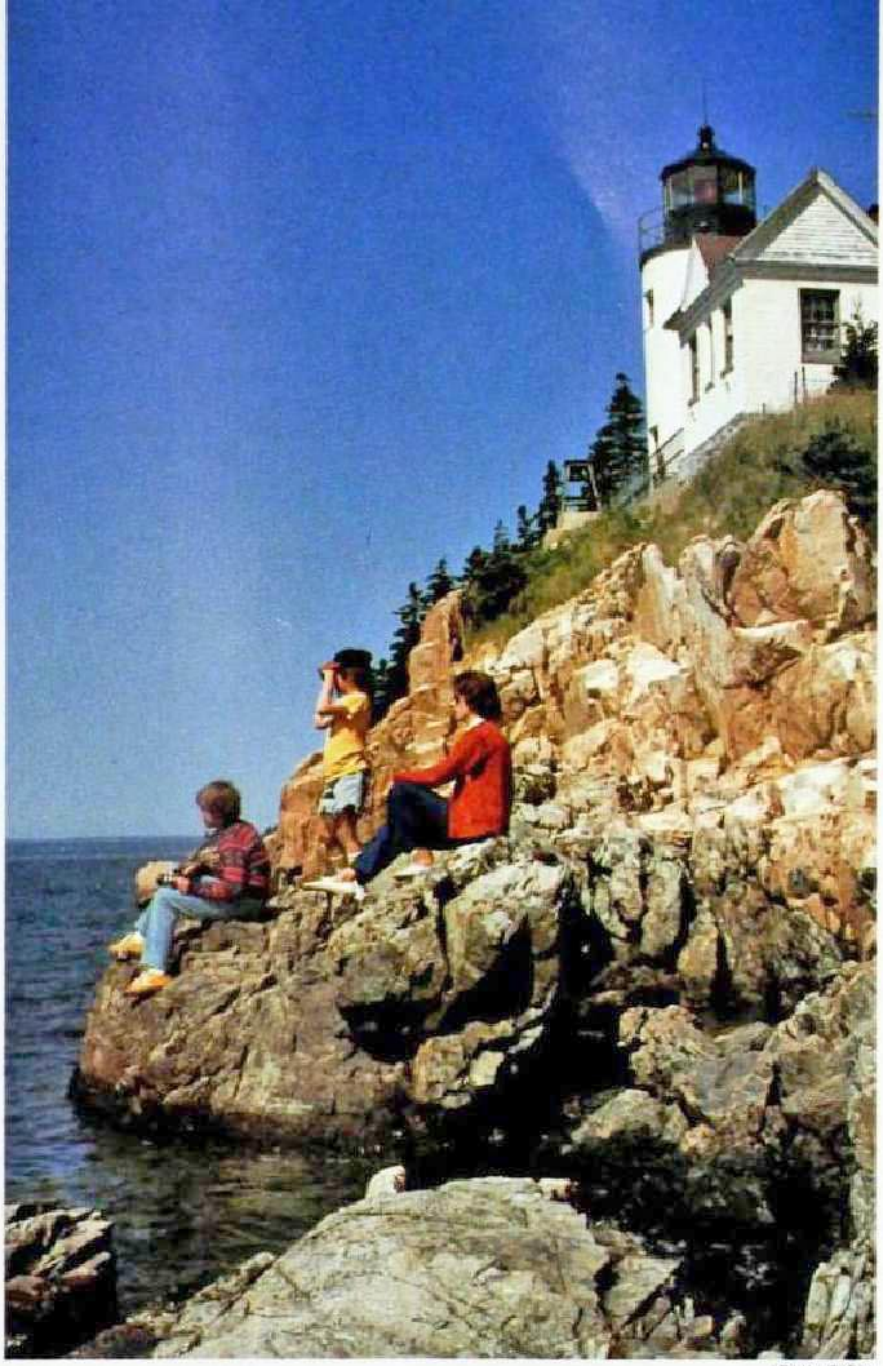
Kodak makes one film for use in KODAK Instant Cameras—KODAK Instant Color Film PR144-10.

The descriptions that follow will help you select a film for color prints.

KODACOLOR II Film is a fast, general-purpose, color-negative film which has extremely fine grain, high sharpness, excellent color reproduction with rich saturated colors, and good versatility. The film's fast speed of ISO (ASA) 100 lets you take pictures under a variety of conditions. KODACOLOR II Film is noted for brilliant reproduction, high resolution, and wide exposure latitude—the ability to produce pleasing results even though moderate exposure errors are made.

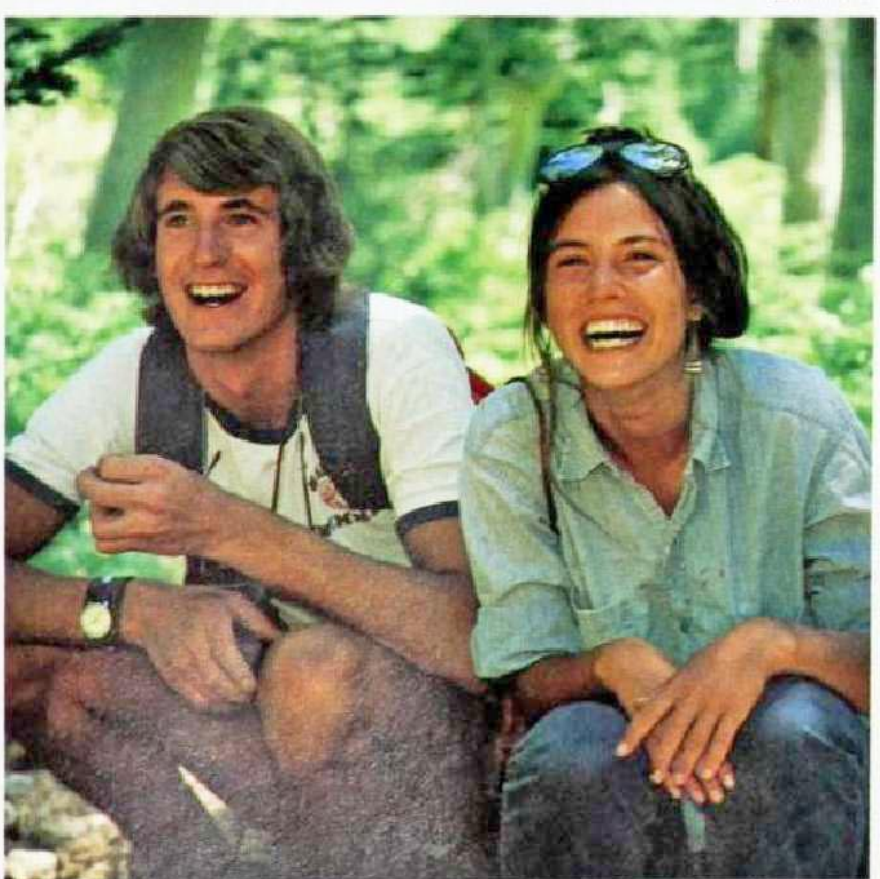
You can take pictures with daylight, electronic flash, or blue flashbulbs. You can also use this film to take pictures by the existing lighting. However, KODACOLOR 400 Film, a faster film, is a better choice for existing-light photography (see page 43). KODACOLOR II Film, though, has finer grain. This is an excellent all-round film for color prints with finely balanced qualities. It's very popular for use in both advanced cameras and simple, non-adjustable and automatic cameras. This film is available in many sizes. See the table on page 128.

When you want color prints and you can use a general-purpose film, choose **KODACOLOR II Film** for your camera.



JOHN FISH

KODACOLOR II Film has a speed of ISO (ASA) 100, which is just right for most picture-taking situations. To take pictures in the shade, such as this one, you need an adjustable or automatic camera.



NORM KERR

KODACOLOR 400 Film is a high-speed, color-negative film for photographing subjects in dim lighting, such as existing light or early or late in the daytime; fast action; subjects requiring good depth of field and high shutter speeds; and for extending the flash distance range.

KODACOLOR 400 Film is Kodak's fastest color-negative film. It has a speed of ISO (ASA) 400 and very fine grain which is excellent for such a high-speed film. This film extends your picture-taking opportunities; it lets you take pictures you couldn't get with a slower-speed film. KODACOLOR 400 Film has great versatility because you can use it to photograph subjects under lighting conditions ranging from bright sunlight to very dim light like firelight, depending on your camera. The film is intended primarily for picture-taking situations where you need high film speed, for example, to photograph your subjects without flash using the natural qualities of the existing lighting, to stop action in existing light, and to use telephoto lenses without much lens speed.

The film's high speed gives you greater exposure capability in dim light, lets you use higher shutter speeds or smaller lens openings, and lets you take flash pictures at greater distances. Higher shutter speeds reduce the effects of camera motion and help stop action, and smaller lens openings increase depth of field.

KODACOLOR 400 Film is color-balanced for daylight, electronic flash, or blue flash. It also has special sensitizing characteristics that let you obtain pleasing pictures under a variety of other light sources, such as household light bulbs and fluorescent lamps, without using camera filters. The film can handle mixed light sources without using filters, as well. For critical use though, such as for portraits with photolamp illumination where optimum color rendition is important, you should use

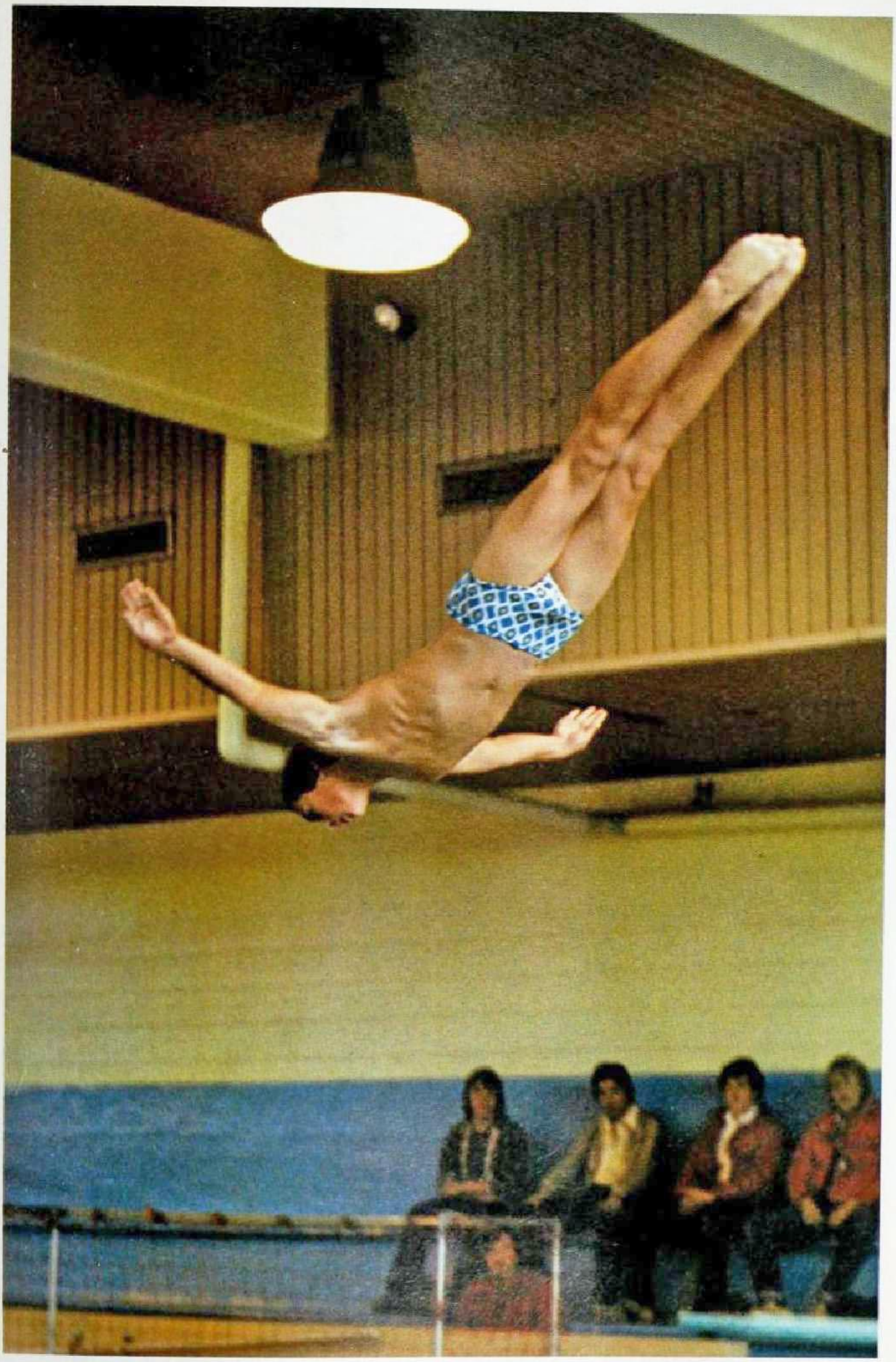
ROBERT ROWE

When your subject is in subdued lighting conditions and you want color prints, a high-speed film—**KODACOLOR 400 Film**—lets you capture the picture if your camera has a fast lens: *f*/5.6 or faster. 1/125 second *f*/4

the recommended filter. See pages 50 and D 4. This film offers wide exposure latitude.

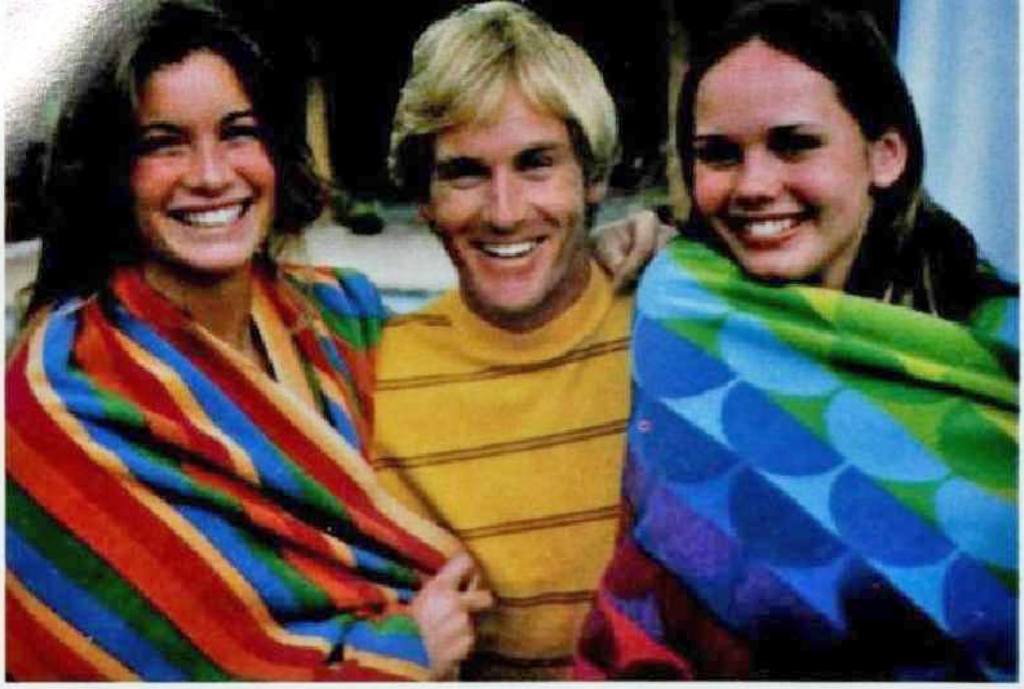
KODACOLOR 400 Film in 110 cartridges is intended for cameras that can sense high-speed film. See your camera manual. For simple, nonadjustable cameras, the 400-speed film can extend the exposure range to include bright sunlight and heavy overcast or open shade. If the camera has a fast lens (for a simple camera) in the *f*/5.6 to *f*/2.8 range, you may be able to take pictures of some existing-light scenes, such as brightly lighted sports arenas, stage sets, and interiors with bright fluorescent light, depending on your camera. With more advanced cameras with faster lenses, you can photograph the whole range of existing-light subjects. See page 43. The film is available in 135, 110, and 120 sizes.

You can send KODACOLOR Films to Kodak or other photofinishing laboratories for processing and printing, or if you're a darkroom enthusiast, you can process these films and print the negatives yourself.



JOHN VAETH

In order to use a high shutter speed to stop motion in dim lighting, you need a high film speed. **KODACOLOR 400 Film,** with a speed of ISO (ASA) 400, gives you the necessary film speed. 1/250 second f/4



TOM MC CARTHY

You can enjoy the fun and instant satisfaction of color prints when you use **KODAK Instant Color Film.**

JIM DENNIS

You can take sharp, brilliant instant pictures with color by Kodak. **KODAK Instant Color Film** gives you beautiful color prints with the elegant KODAK SATINLUXE® Finish.

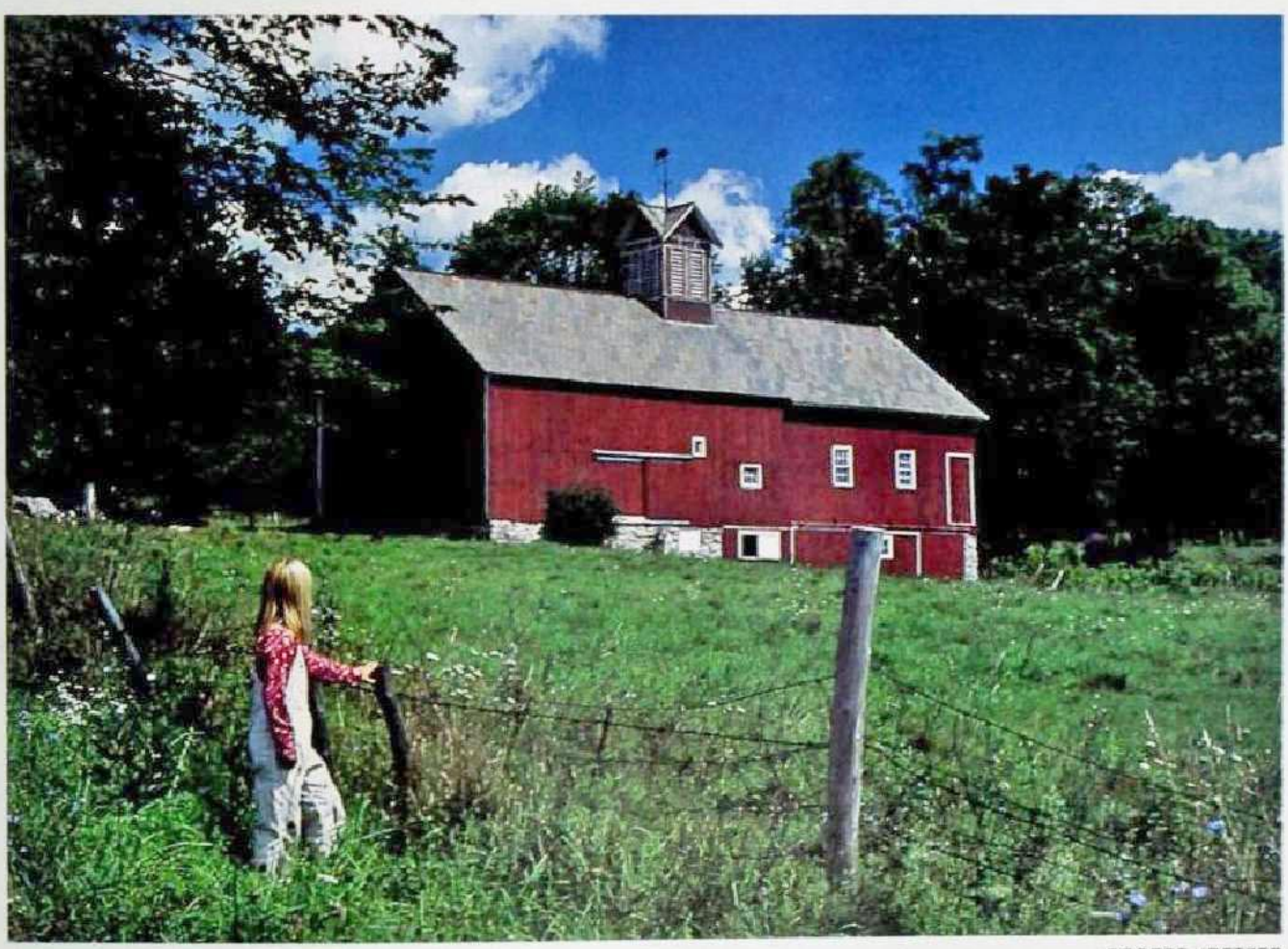
KODAK Instant Color Film, for use in KODAK Instant Cameras and Instant Film Backs, produces brilliant, rectangular, color prints directly from the camera. You can compose the picture for either a vertical or a horizontal format. After you take the picture, the development process starts as the print is ejected from the camera. The picture develops right before your eyes without peeling, timing, or litter. An image begins to form in approximately 30 seconds at room temperature. You can judge expression and composition in about 90 seconds and exposure in 2 to 3 minutes. The color picture is essentially complete in about 5 minutes under normal temperature conditions. If you want to take additional pictures you can concentrate on your subject since the prints develop fully by themselves.

Prints from KODAK Instant Color Film have an elegant, textured KODAK SATINLUXE Finish which gives a pleasing appearance and helps protect the prints from smudges and fingerprints. The film produces beautiful color rendition—colors by Kodak are bright and sharp. It's designed for taking pictures in daylight or with electronic flash or blue flash.

FILMS FOR COLOR SLIDES

Kodak offers several color-slide films, each with different characteristics. One of the most obvious differences is film speed. Some of the other characteristics, such as color rendition, sharpness, and graininess, are more subtle—a critical comparison would be required to see the differences between films. Actually, personal preference is usually the most dominant factor in selecting a color-slide film. The following descriptions will help you choose a film to suit your needs.

KODACHROME 25 Film (Daylight) is a popular color-slide film noted for extremely high sharpness and extremely fine grain. The film features excellent color quality—pleasing flesh tones, clean whites and yellows, bright reds, greens, and blues, and realistic sky reproduction. KODACHROME 25 Film has good exposure latitude and tone reproduction. It retains good detail in highlights and shadow areas. This film with a speed of ISO (ASA) 25 is for use with daylight, electronic flash, or blue flashbulbs. We recommend the film for bright-light situations where you want the best possible image quality. KODACHROME 25 Film is available in 135 size only.



ROBERT KRETZER

KODACHROME 25 Film (Daylight) is an excellent general-purpose film for color slides. It is well known for its superb sharpness and extremely fine grain. 1/125 sec *f*/8

ROBERT KRETZER

Choosing a color film by the way it records
various colors is a matter of personal taste.
The flesh tones produced by **KODACHROME 25 Film (Daylight)**
make it a favorite film for many people.

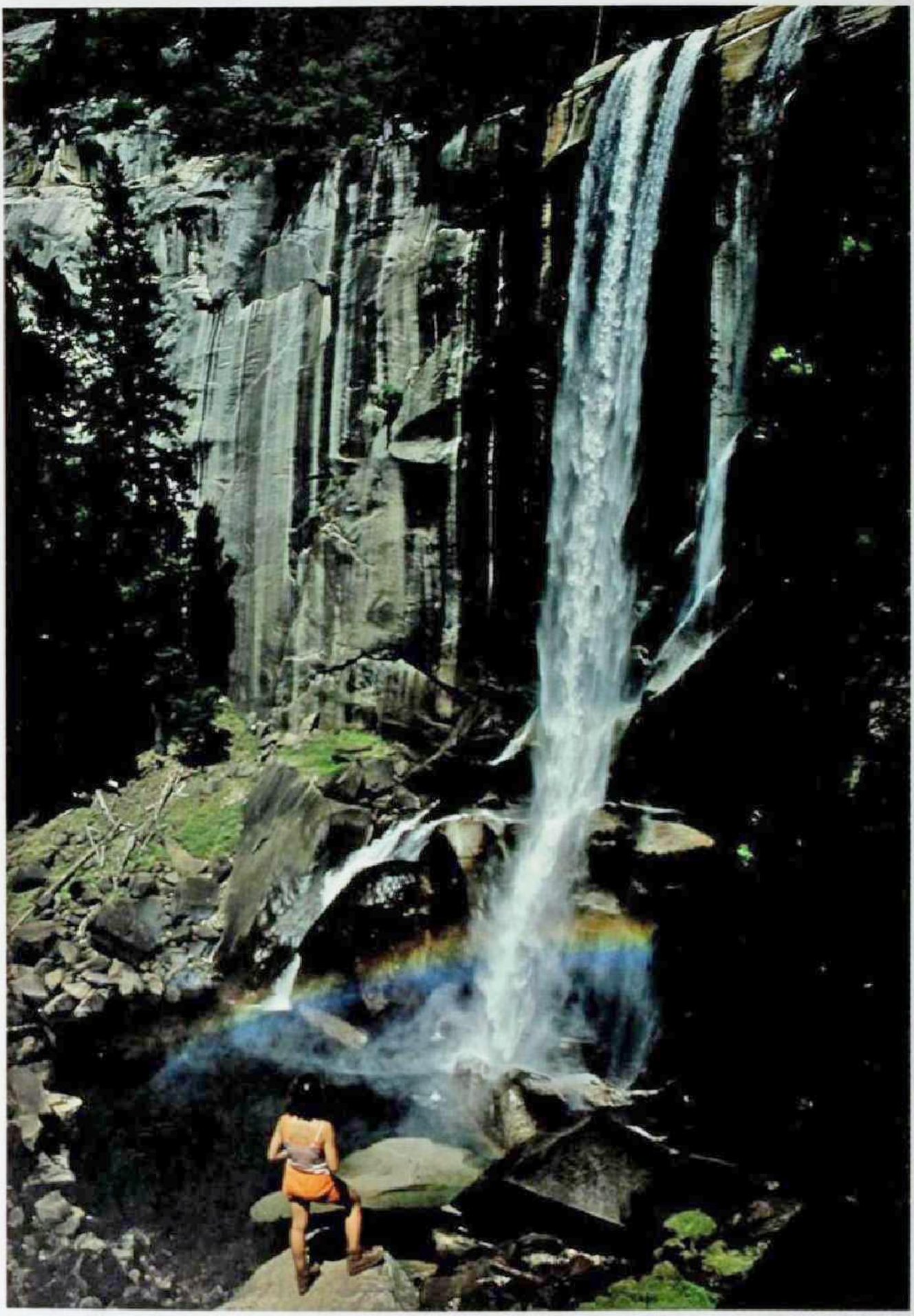
GARY WHELPLEY

The delicate colors and intricate detail of Indian jewelry have been superbly reproduced by **KODACHROME 64 Film (Daylight).**

KODACHROME 64 Film (Daylight) is a good choice for all-around picture-taking when you want color slides. Its ISO (ASA) 64 speed lets you use higher shutter speeds or smaller lens openings under normal lighting conditions and extends picture-taking capability on overcast days, in the shade, or in somewhat subdued lighting. The film produces excellent color rendition with crisp, saturated colors—bright reds, greens, and blues; clean whites and yellows; good blue skies; and pleasant flesh tones. In addition, the film shows adequate detail in both highlight and shadow areas. It has good exposure latitude that helps yield pleasing results even with moderate underexposure or overexposure.

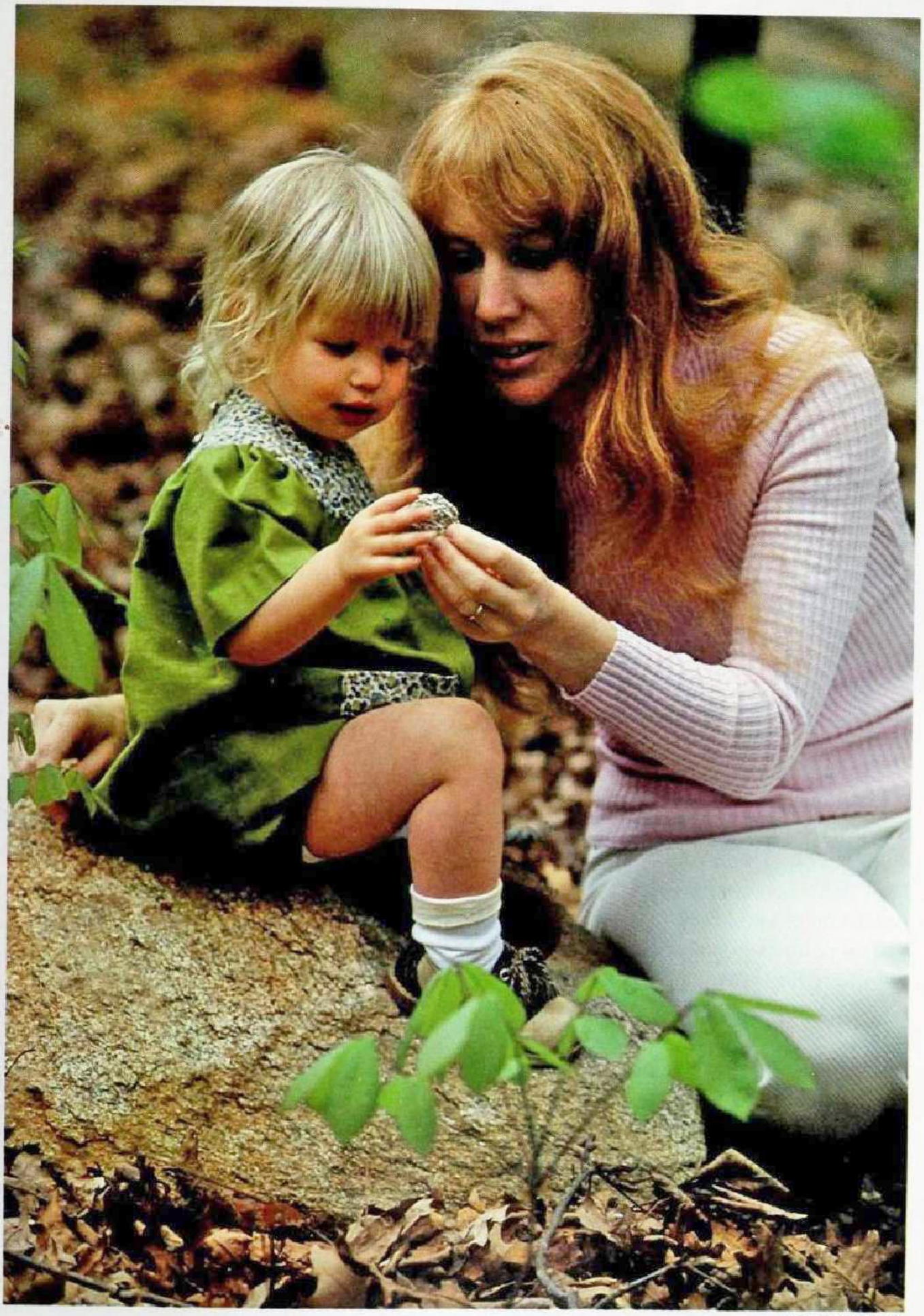
KODACHROME 64 Film is almost as sharp and fine-grained as KODACHROME 25 Film. At normal screen viewing distances, most viewers can't see any difference in sharpness or graininess. KODACHROME 64 Film is for use in daylight or with electronic flash or blue flash. It comes in sizes 135, 110, and 126.

Have your KODACHROME Films processed by Kodak or another commercial laboratory. You can't process these films in your own darkroom because the process is highly complex and requires commercial photofinishing equipment.



GARY WHELPLEY

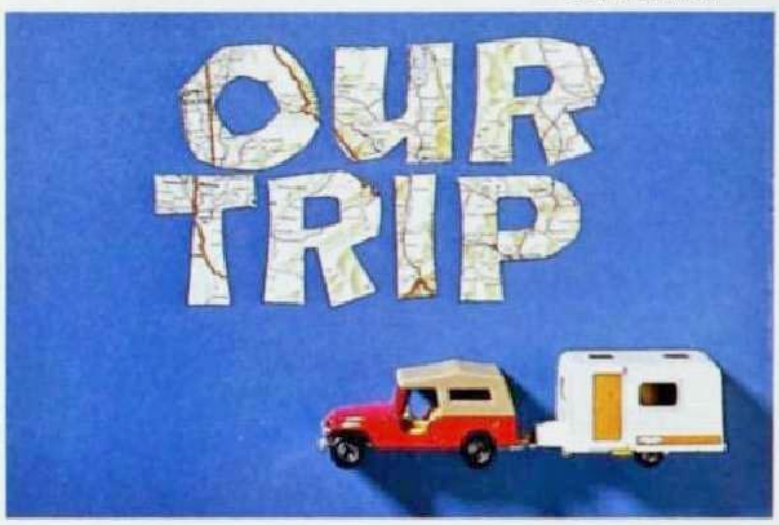
KODACHROME 64 Film (Daylight) has many of the same fine qualities as KODACHROME 25 Film (Daylight) but more than twice as much speed—ISO (ASA) 64. The high-quality color rendition of KODACHROME 64 Film helps make it a great film for general picture-taking.



NEIL MONTANUS

The extra speed of **KODACHROME 64 Film (Daylight)** is especially helpful when the light level is reduced, as it was in this picture made on an overcast day. 1/250 sec *f*/4

BOB CLEMENS



JOHN HOOD

KODACHROME 40 Film 5070 (Type A) is a color-slide film designed for taking pictures with 3400 K photolamps. It has a speed of ISO (ASA) 40 with this illumination. This film is valued for its high definition characteristics and its excellent color rendition.

The color balance of KODACHROME 40 Film for photolamp lighting together with its snap, brilliance, and color fidelity make it an excellent film for informal portraits, close-ups, title slides, and for copying color originals. The film's extremely high sharpness, extremely fine grain, and ability to record fine detail will provide high-quality color slides. You can also take pictures in daylight when you use a No. 85 filter over your camera lens with a film speed of ISO (ASA) 25. You can purchase this film in 135 size.

KODACHROME 40 Film is processed in the same commercial process as KODACHROME 25 and 64 Films (Daylight).

If you use title slides, they will help make your slide show more effective and enjoyable. **KODACHROME 40 Film 5070 (Type A)** is a good choice for making your title slides. It produces outstanding results with 3400 K photolamp lighting, which is easy to control.

BOB CLEMENS

KODACHROME 40 Film 5070 (Type A) is an excellent color-slide film to use for informal portraits of subjects lighted by 3400 K photolamps.

RICHARD MC COY

Many people prefer **KODAK EKTACHROME 64 Film (Daylight),** but here again it's a matter of personal taste. This is an excellent film for general picture-taking when you want color slides. Tournament of Roses Parade, Pasadena, California.

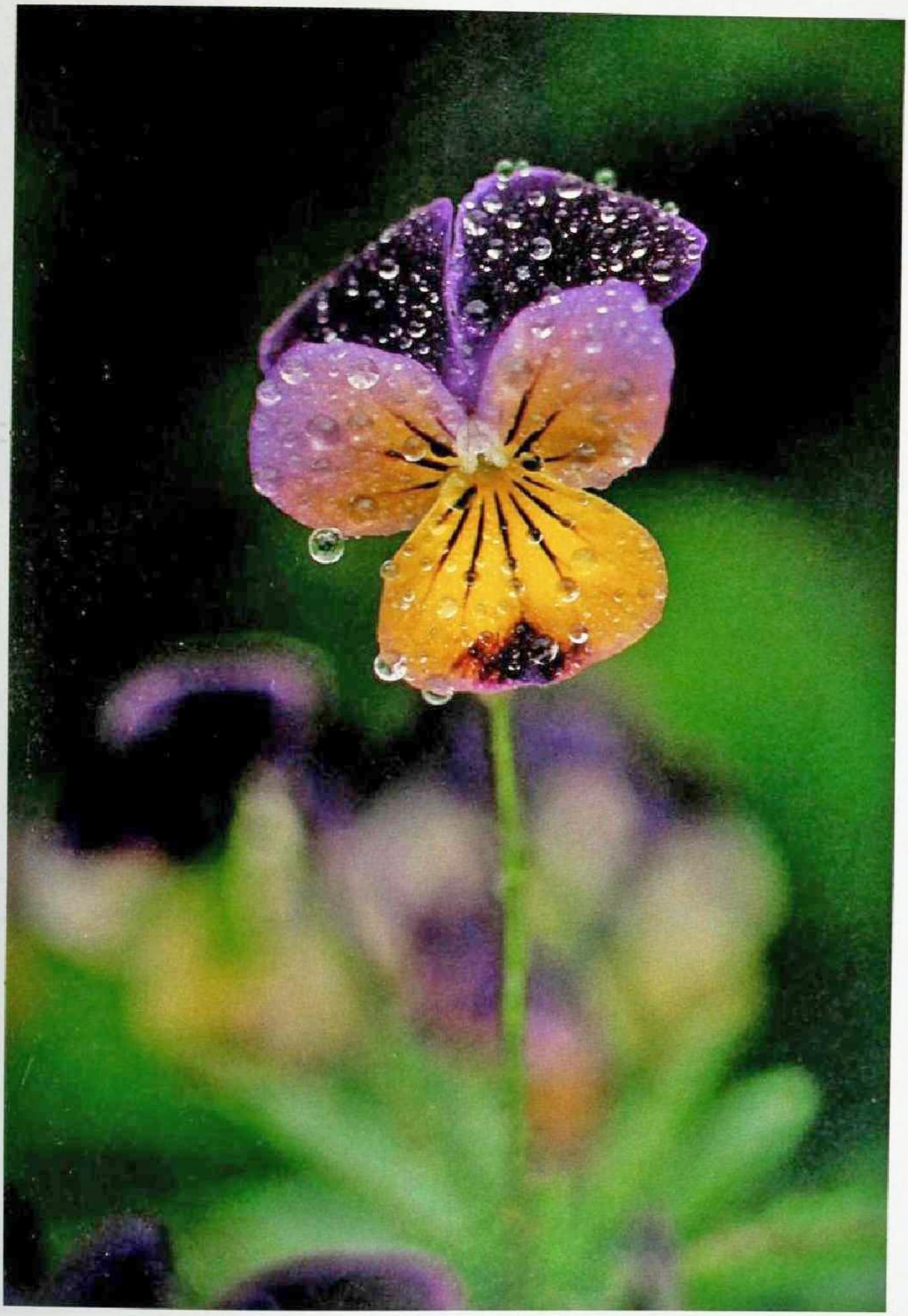
KODAK EKTACHROME 64 Film (Daylight) is an excellent general-purpose color-slide film with a speed of ISO (ASA) 64. EKTACHROME 64 Film offers superb color reproduction for very pleasing flesh tones, vivid blue skies, bright reds and yellows, clean highlights, and good shadow detail. The film distinguishes well between similar colors, such as red and orange.

EKTACHROME 64 Film has very high sharpness and very fine grain which give high image quality. This film is not quite as sharp or fine-grained as KODACHROME 64 Film, but it's difficult to see the difference in sharpness or graininess on the projection screen. EKTACHROME 64 Film is a daylight-type film. For flash pictures, use electronic flash or blue flashbulbs. This film is available in several sizes. Refer to the table on page 128.

An additional feature of all KODAK EKTACHROME Films is that you can process these films in your own darkroom when you want to.

GARY WHELPLEY

One of the many fine features of **KODAK EKTACHROME 64 Film (Daylight)** is its outstanding color reproduction.



DON MAGGIO

In this picture, the high fidelity of
KODAK EKTACHROME 64 Film (Daylight) gives you
the feeling that you can almost reach out
and touch the blossom.

KODAK EKTACHROME 200 Film (Daylight) is a high-speed color-slide film for photographing dimly lighted subjects, such as those in existing light; subjects that require good depth of field and high shutter speeds; fast action; and for extending the flash distance range. This film is a good choice for lengthening your photographic day—from early morning to late in the day. The film has a speed of ISO (ASA) 200. It is designed for use with daylight, electronic flash, or blue flashbulbs. You can also use it to photograph subjects illuminated by carbon-arc spotlights. This is a versatile film which lets you photograph in a large range of lighting conditions from bright sunlight to dim existing light, depending on your camera.

EKTACHROME 200 Film (Daylight) is the film to use when you need a high-speed color-slide film with very fine grain. If you want to use a telephoto lens with high shutter speeds and get good depth of field, or if you want to capture action on a dull, overcast day, EKTACHROME 200 Film is a good choice. The film's excellent graininess characteristics are quite significant for its high speed because EKTACHROME 200 Film has nearly as fine grain as that of EKTACHROME 64 Film. The difference in graininess between the two films is usually not evident in projected slides viewed from a normal viewing distance. EKTACHROME 200 Film produces fine color quality with clean color separation between similar hues. In comparison with the 64-speed film, the 200-speed film gives slightly less saturated colors. EKTACHROME 200 Film is available in 135 and 126 sizes.

DON MAGGIO

KODAK EKTACHROME 200 Film (Daylight) with its high speed of ISO (ASA) 200 is especially suited for taking color slides in the home by existing daylight. This film gives you very fine grain and pleasing color rendition as well as the high film speed.

BARBARA JEAN

KODAK EKTACHROME 200 and 160 Films have been designed for taking pictures under existing lighting conditions, such as those in the Air and Space Museum, Washington, D. C. The Daylight film produces a natural appearance in this scene illuminated by the daylight coming through the windows. If Tungsten film had been used, this picture would be too blue.

PETER GALES

When you want to photograph action in color slides and perhaps use a telephoto lens, a high-speed film will allow you to use the high shutter speeds you'll need. **KODAK EKTACHROME 200 Film (Daylight)** has the speed—ISO (ASA) 200—and high quality to give you excellent results.

JIM DENNIS

KODAK EKTACHROME 400 Film (Daylight) is a great film for taking color slides under the existing lighting conditions where you often need a high-speed film. The high-wire act at the Damascus Temple Shrine Circus was illuminated by carbon-arc spotlights.

KODAK EKTACHROME 400 Film (Daylight) is a very high-speed color-slide film for use when you need a lot of film speed such as in existing light or early or late in the day where subjects are often dimly lighted; for subjects where you want both good depth of field and high shutter speeds; and for stopping fast action in your pictures, such as sports.

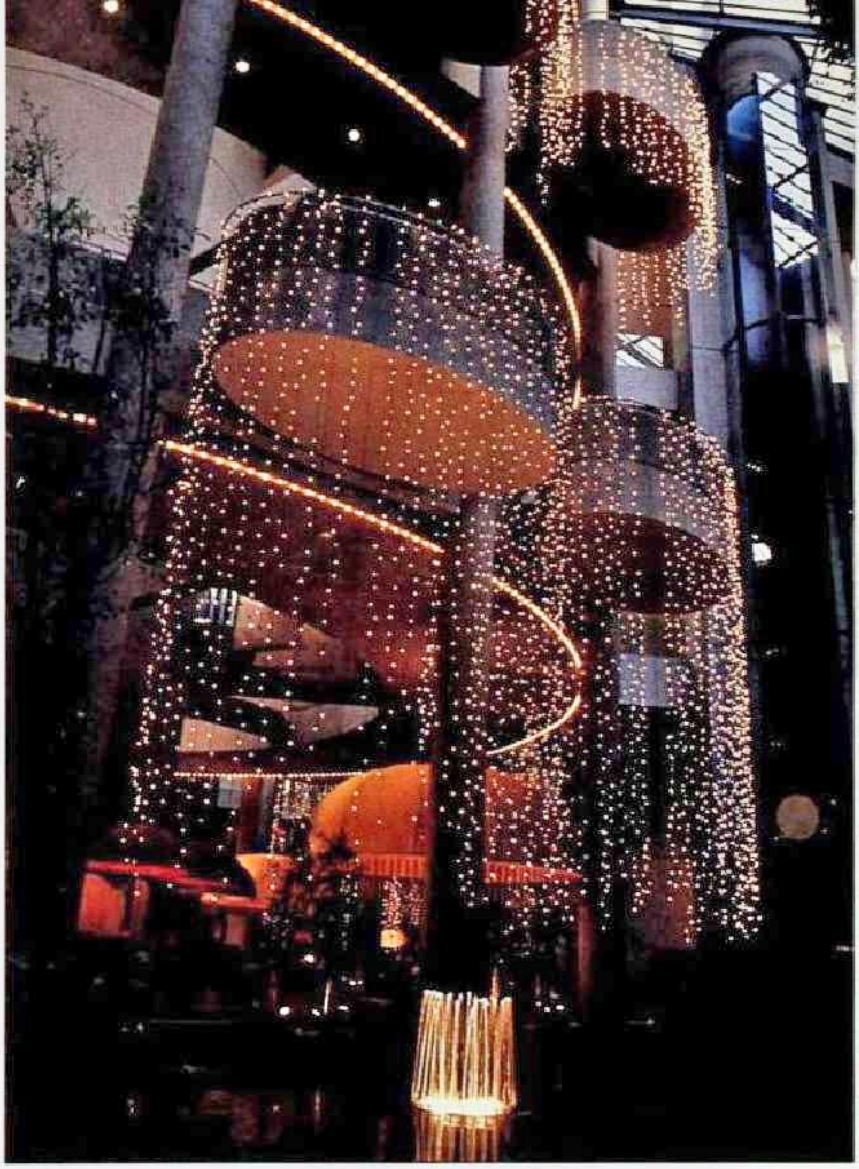
This is Kodak's fastest color-slide film. It has a speed of ISO (ASA) 400. The film's high speed means that you can get handheld shots where there's barely enough light to focus when your camera has an *f*/2 or faster lens. The film is good for pictures with long telephoto lenses which don't have large lens openings and where you'll want to use a high shutter speed to avoid camera motion effects or to stop action. For example, you can freeze action at 1/1000 second with medium aperture telephoto lenses, depending on the lighting. This 400-speed film lets you take flash pictures at greater distances than other Kodak color-slide films.

EKTACHROME 400 Film gives magnificent color rendition—richly saturated colors with full tonal values. The film is color-balanced for daylight, electronic flash, or blue flashbulbs. With this film you can also photograph subjects lighted by carbon-arc spotlights.

EKTACHROME 400 Film has good sharpness for a high-speed film and it has fine grain although the grain is not quite as fine as that of EKTACHROME 200 Film. This difference in graininess is not readily discernable under normal projection conditions. Grain characteristics of the two films are comparable when EKTACHROME 200 Film is push processed for a film speed of ISO (ASA) 400. When EKTACHROME 400 Film is push processed, it offers the outstanding

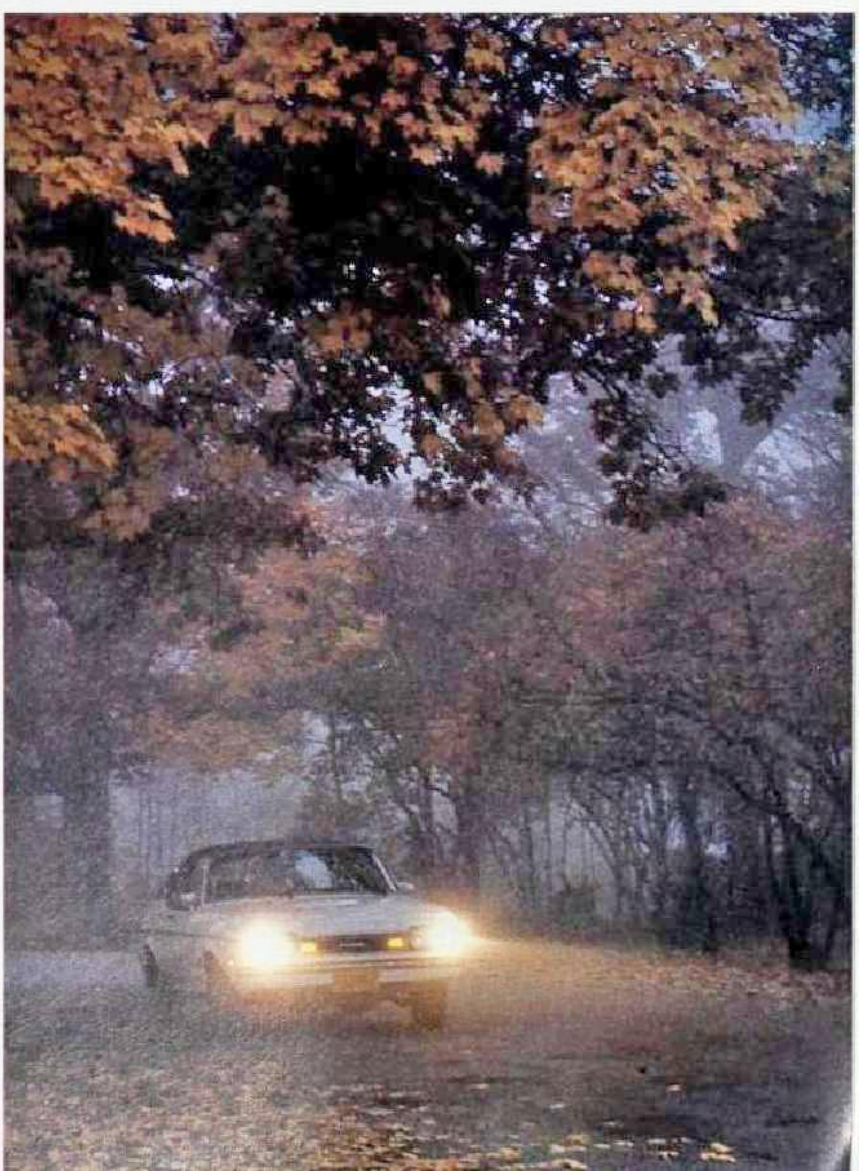
feature of an extremely high film speed of ISO (ASA) 800 with high quality which lets you shoot pictures under the most difficult lighting conditions. You can also have other EKTACHROME Films push processed for increased speed. See page 37.

When you need a color-slide film with maximum speed for tungsten illumination, for example in low-light conditions, you can use EKTACHROME 400 Film without using a light-balancing filter. This will produce warm or yellow-red results. Many people find such slides acceptable because tungsten lighting has a natural, warm quality. This film is sold in 135 and 120 sizes.



This interesting hotel lobby, lighted by a combination of daylight and tungsten light, was realistically recorded on **KODAK EKTACHROME 400 Film (Daylight).**

KEITH BOAS



The high speed of **KODAK EKTACHROME 400 Film (Daylight)** was beneficial for photographing this low-light scene. The high film speed let the photographer use a small lens opening for good depth of field without putting the camera on a tripod even though the lighting was dim. With this film you can usually take pictures under adverse lighting conditions while handholding your camera.

RICH FREEMAN

BOB CLEMENS

For taking the most natural-looking pictures at home, use the existing lighting. When the lighting is provided by tungsten household lamps and you want color slides, you can use **KODAK EKTACHROME 160 Film (Tungsten),** which is designed for this kind of picture-taking. It has a speed of ISO (ASA) 160.

KODAK EKTACHROME 160 Film (Tungsten) is a color-slide film designed for use with 3200 K tungsten lamps without using filters or with existing tungsten light, such as the light from household lamps and other general-purpose lamps. This film has a high speed of ISO (ASA) 160, and excellent color rendition and sharpness. EKTACHROME 160 Film distinguishes well between similar colors. Its color quality and sharpness are similar to those of EKTACHROME 200 Film (Daylight). You can also take pictures in daylight with the Tungsten film when you use a No. 85B filter over your camera lens, reducing the effective film speed to ISO (ASA) 100.

For taking pictures under dim tungsten existing-light conditions where you may need more film speed, you can have this film push processed to increase its speed by 2 times to ISO (ASA) 320. See page 37. The film is sold in 135 size.

CAROLINE GRIMES

KODAK EKTACHROME 160 Film (Tungsten) is a splendid color-slide film for night scenes. This view captures the exciting lighting of signs in Las Vegas, Nevada. 1/30 sec *f*/4

CAROLINE GRIMES

When you want to take color slides in public places lighted by tungsten lighting, you need a high-speed tungsten film. **KODAK EKTACHROME 160 Film (Tungsten)** is well-suited for this purpose. Museum of Science and Industry, Chicago, Illinois.

The appearance of the flowers has been converted into bizarre colors by **KODAK EKTACHROME Infrared Film 2236** with a No. 15 filter over the lens.

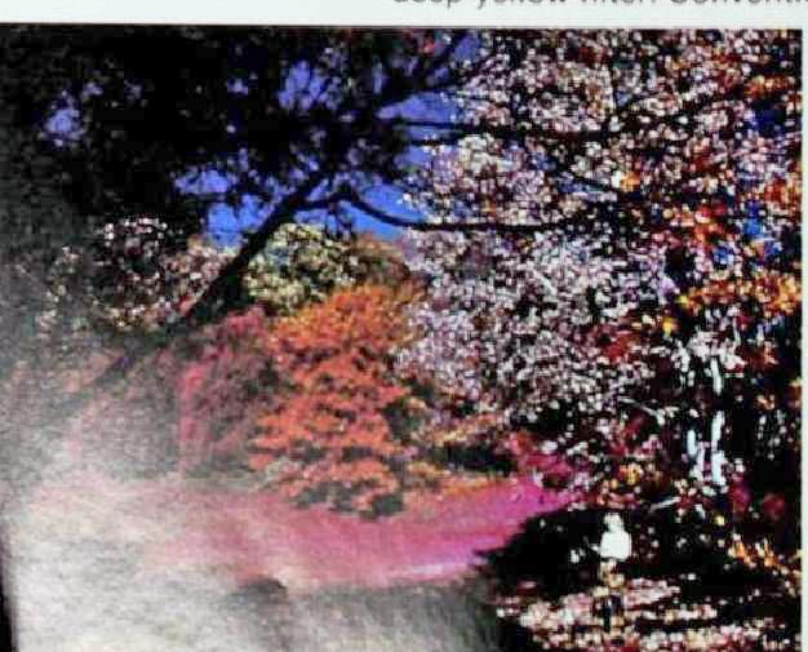
Conventional color rendition. KODAK EKTACHROME 64 Film (Daylight) DON MAC

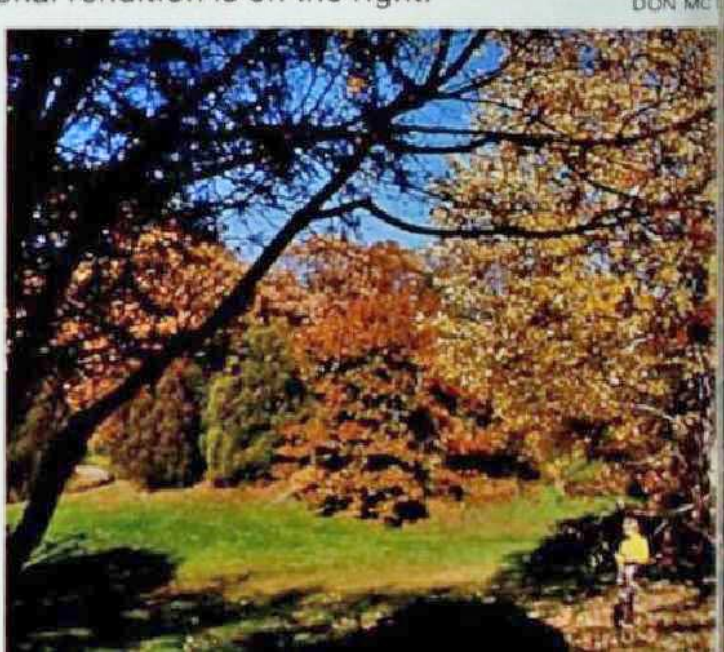
KODAK EKTACHROME Infrared Film 2236 is a false-color film originally designed for camouflage detection in aerial photography. In addition to aerial work, it's primarily used for some medical and scientific applications. Some photographers like to experiment with this film for bizarre, abstract results. It's sensitive to both visible and infrared radiation and produces some weird and interesting effects, such as red grass and trees and flowers with strange colors. For example, a red rose with green leaves will photograph as yellow with red leaves. Some objects are recorded on this film in much the same way as with conventional color films, while others change colors completely.

The film is designed for use with daylight and electronic flash. You can also use blue flashbulbs for noncritical work. With these light sources you use a No. 12 yellow filter for the intended color balance. Or you can use a No. 15 deep-yellow filter for very similar results. With either filter, the film has a speed of 100. See page D 22.

You can experiment with other color filters for different, bizarre color rendition. The film is available only in 135 magazines, 20 exposures.

When you want to experiment with color slides, try **KODAK EKTACHROME Infrared Film 2236** for abstract results. Photographed through a No. 15 deep-yellow filter. Conventional rendition is on the right. DON MC





KODAK EKTACHROME Slide Duplicating Film 5071 (Process E-6) is a color-slide film for copying original color slides. The contrast and color reproduction characteristics and the very high sharpness and extremely fine grain make this an outstanding film for making excellent duplicates which are difficult to distinguish from the original slides.

The film is for use with slow exposure times of about 1 second with tungsten illumination. You can also use the 5071 film with sunlight at the same slow exposure times. There is another similar version of this film—KODAK EKTACHROME SE Duplicating Film SO-366, CAT NO. 159 0223—which is designed for short exposure times with electronic flash at approximately 1/1000 second flash duration. This film has the same color and definition characteristics as the 5071 film. You can also use the SO-366 film with sunlight at exposure times of 1/10 second or shorter.

With both of these films, you expose them using color filters, like those used for color printing, to balance the light source to each new film emulsion. See pages D 24 and D 25.

Sometimes when the original slides are less than ideal, you may be able to make improvements when you make the duplicates, such as cropping for better composition, correcting for exposure, correcting or changing color, and combining two or more images in one duplicate slide. The potential for creating new interpretations from your original slides is considerable.

These films are sold in 135 magazines, 36 exposures. The films are not intended for general, pictorial photography.

DON MAGGIO

KODAK EKTACHROME Slide Duplicating Film 5071 (Process E-6) is a superb film for making duplicate color slides from original color slides. Sometimes you can make the duplicate slide better than the original. Here the duplicate was cropped for improved composition.

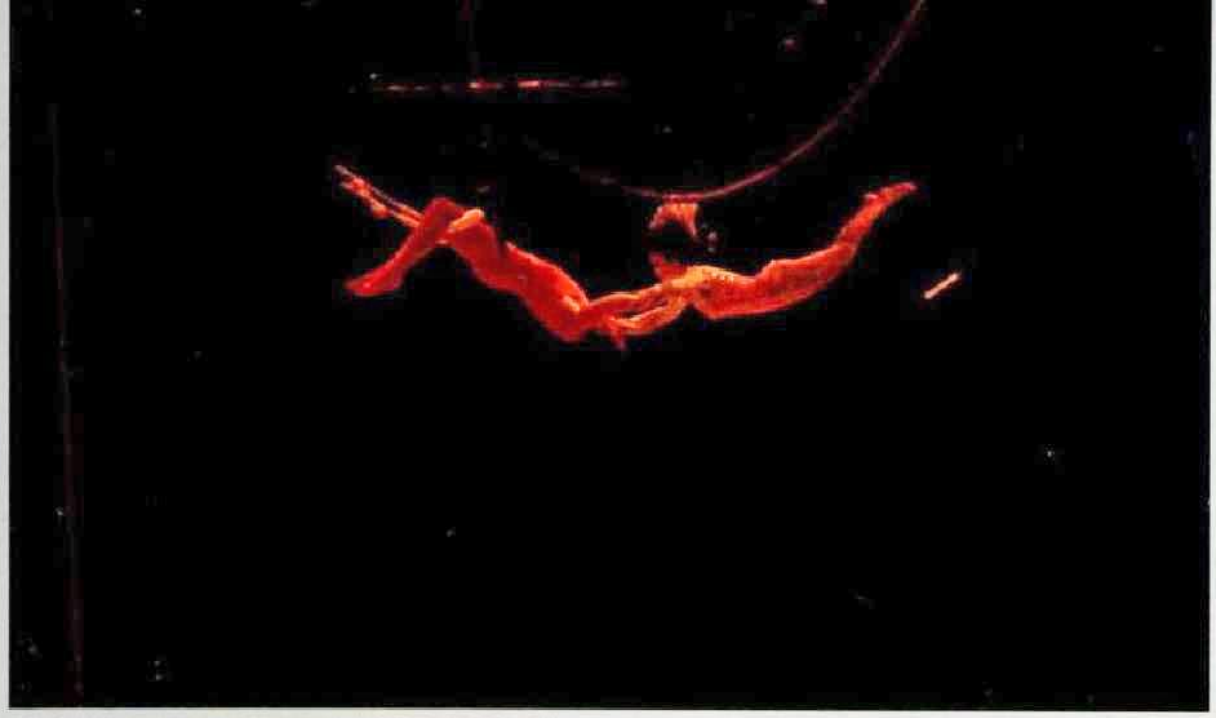
Original slide

CAROLINE GRIMES

EKTACHROME 400, 200, and 160 Films have an exceptional feature. You can expose the 135- and 120-size films at 2 times their normal speeds when you have the films specially processed. EKTACHROME 200 Film (Daylight) with ESP-1 Processing—ISO (ASA) 400, 1/125 sec f/4. Damascus Temple Shrine Circus

ROBERT KRETZER

Home lighting at night is relatively dim so you need a very high film speed for handholding your camera. Otherwise, with films that have less speed, you may have to use slower shutter speeds and use a camera support, such as a tripod. EKTACHROME 160 Film (Tungsten) with special processing—ISO (ASA) 320, 1/30 sec *f*/2



CAROLINE GRIMES

EKTACHROME 400 Film (Daylight) with ESP-1 Processing offers an exceptionally high speed of ISO (ASA) 800 to help you stop action in low-light pictures. Damascus Temple Shrine Circus, 1/250 sec *f*/2.8

Increased Film Speed with KODAK EKTACHROME 400, 200, and 160 Films. An exceptional feature of EKTACHROME 400, 200, and 160 Films (and of KODAK EKTACHROME 200 and 160 Professional Films, see page 40) is that you can expose them at higher-than-normal speeds when you obtain special processing. Kodak in the U.S.A. offers a special processing service for these films, in 135 and 120 sizes, which increases the effective speed to 2 times the normal speed (1 stop). The speeds are increased to ISO (ASA) 800 for EKTACHROME 400 Film (Daylight), ISO (ASA) 400 for EKTACHROME 200 Film (Daylight), and ISO (ASA) 320 for EKTACHROME 160 Film (Tungsten).

When necessary, you can specify the special processing for KODAK EKTACHROME 64 Film (Daylight) [also KODAK EKTACHROME 64 Professional (Daylight) and KODAK EKTACHROME 50 Professional (Tungsten) Films]. The speed of EKTACHROME 64 Film is increased to ISO (ASA) 125. [The speed of EKTACHROME 50 Professional Film is increased to ISO (ASA) 100.] However, since quality is reduced slightly with special processing, it's seldom practical to pay the additional cost of the special processing for these films when you can use EKTACHROME 400, 200, and 160 Films at their normal speeds of ISO (ASA) 400, ISO (ASA) 200, and ISO (ASA) 160.

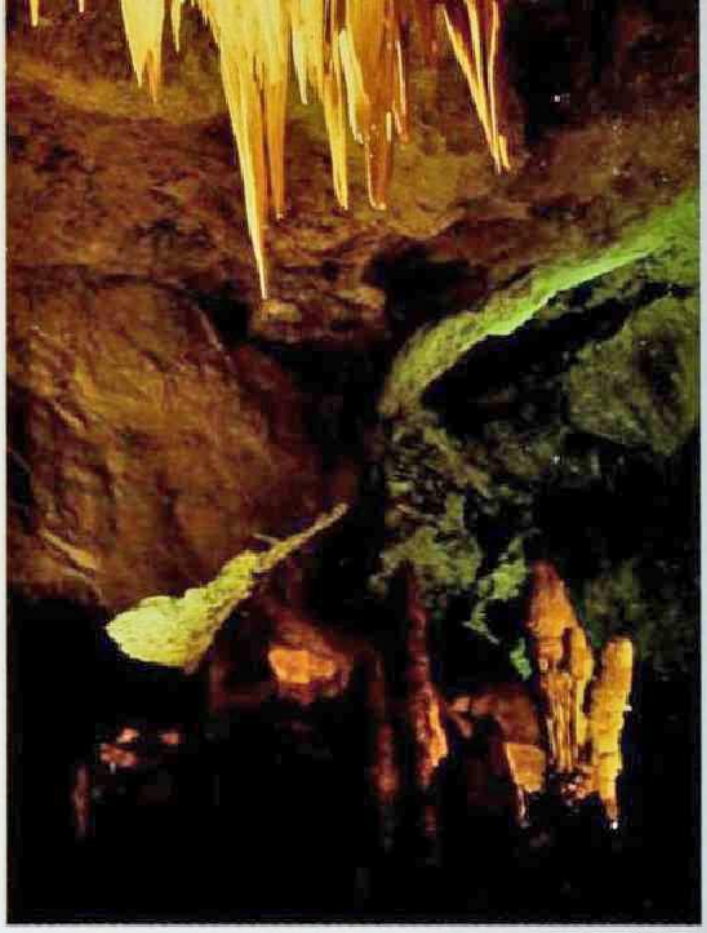
The processing section on page 54 tells how you can obtain special processing of your film.

You'll obtain the best quality with EKTACHROME 400, 200, and 160 Films when you expose the films at their normal speeds and have them processed normally. However, the very high film speed and high quality of these films with special processing make possible many opportunities for color pictures that would be impossible or impractical with slower-speed films. The increased speed is very helpful under dim lighting conditions—in existing light, for example. It's also helpful when you want to use high shutter speeds and small lens openings. Special processing increases contrast and graininess to some extent. However, these changes are not too noticeable on the screen. The overall quality is very good.

When you take pictures with KODAK EKTACHROME 400, 200, and 160 Films at high shutter speeds combined with small lens openings, there is an additional exposure factor to be aware of in determining exposure for some cameras. This is discussed on page 104.

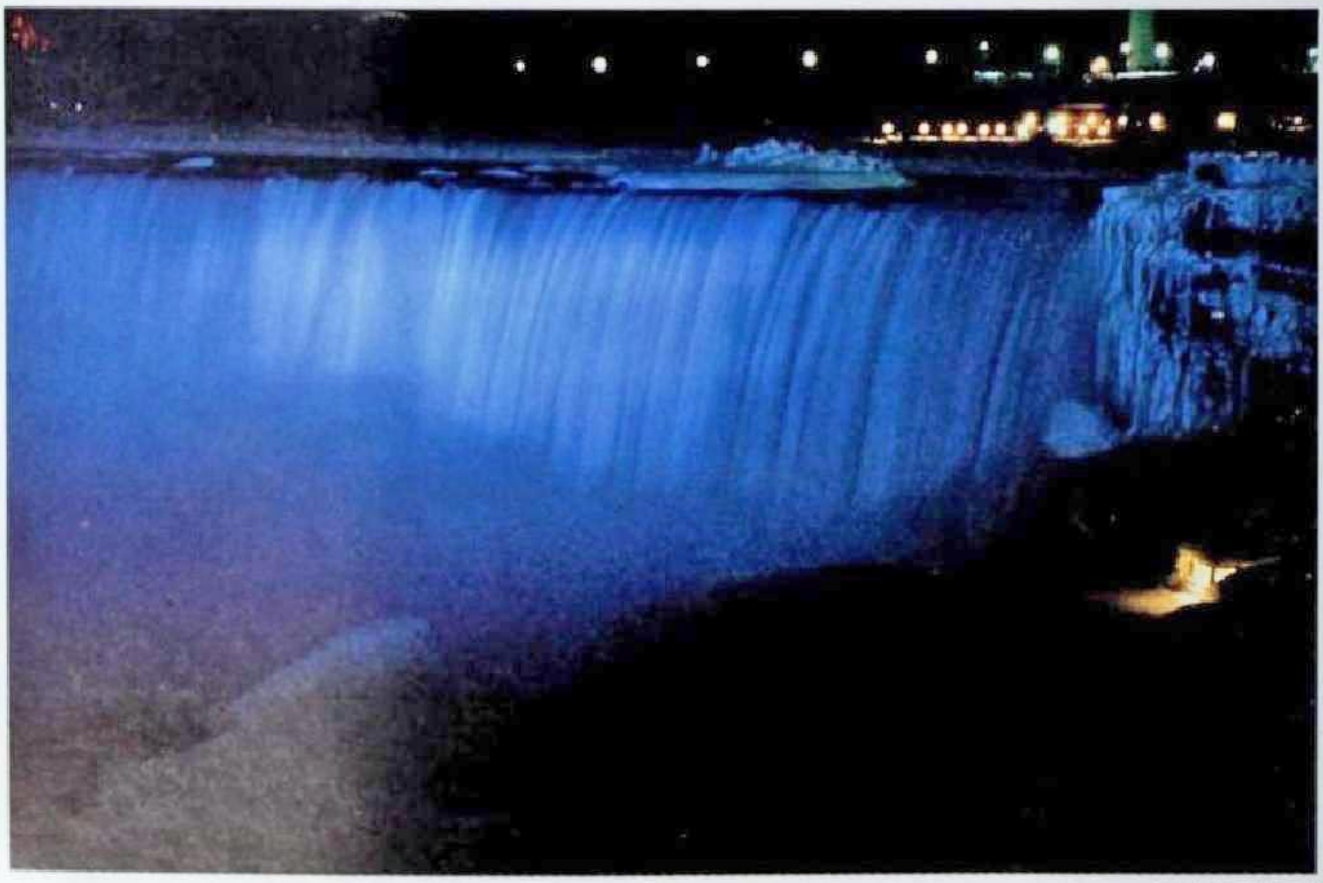
NEIL MONTANUS

A parade at night is another situation that requires a high-speed film. EKTACHROME 200 Film (Daylight) with special processing—ISO (ASA) 400. Carnival time in Rio de Janeiro, Brazil. 1/60 sec *f*/4



ROGER SMITH

Since the existing lighting in caverns is quite dim, you need a lot of film speed to take pictures without flash and record the natural appearance of the lighting. EKTACHROME 200 Film (Daylight) with special processing—ISO (ASA) 400. Carlsbad Caverns, 1/15 sec *f*/1.4



MARTIN TAYLOR

To photograph Niagara Falls at night it helps to have all the film speed you can get. EKTACHROME 400 Film (Daylight) with ESP-1 Processing for a film speed of ISO (ASA) 800.

OTHER *KODAK* COLOR FILMS

The following films are designed for the professional; therefore, only brief descriptions are given in this book. If you have questions about these films, write to Eastman Kodak Company, Photo Information, Department 841, 343 State Street, Rochester, New York 14650. In foreign countries contact the normal source for Kodak products in that country. The book *KODAK Color Films for Professional Use* (E-77), available from photo dealers and bookstores—mainly bookstores in most foreign countries, includes technical data and other information for the films described here.

Since these films are intended for critical photography by professional photographers, they are manufactured with more rigid requirements for storage and handling than Kodak color films for general use. Store unexposed professional color films under refrigeration—55°F (13°C) or lower, unless different storage recommendations are given on the film carton or film instructions. After exposure, it's important to have these films processed promptly. See "Storage and Care of KODAK Films," page 111.

KODAK VERICOLOR II Professional Film, Type S, is a color-negative film intended primarily for professional use and professional photofinishing equipment and procedures. This film is designed for portraiture and commercial work. It has slightly lower contrast and less saturated colors than KODACOLOR II Film, and gives particularly pleasing flesh tones. VERICOLOR II Professional Film, Type S, is color-balanced for use without a filter in daylight or with electronic flash or blue flash. It has a speed of ISO (ASA) 125 and excellent graininess characteristics. With this film you must use an exposure time of 1/10 second or less. It's available in sizes 135, 120, and 220 and in sheet-film sizes.

KODAK VERICOLOR II Commercial Film, Type S, is a color-negative film similar to KODAK VERICOLOR II Professional Film, Type S, except that the Commercial Film has about 15 percent higher contrast. Commercial, Type S, Film has the same daylight color balance as the Professional, Type S, Film.

The Commercial Film's higher contrast is beneficial for pictures, such as outdoor portraits photographed under low-contrast lighting conditions as on cloudy days or in the shade, when you want prints with more snap. The film is excellent for commercial, industrial, and aerial photography, and for copy work where increased contrast is desirable. Commercial, Type S, Film has contrast approximately equal to that of KODAK VERICOLOR II Professional, Type L, and KODACOLOR Film.

VERICOLOR II Commercial Film has a speed of ISO (ASA) 100. Use this film with exposure times of 1/10 second or less. For flash pictures you can use electronic flash or blue flash without filters. The film is sold only in 120 size.

KODAK VERICOLOR II Professional Film, Type L, is the tungsten-light version of VERICOLOR Film. The Type L Film has higher contrast than VERICOLOR II Professional Film, Type S, which is desirable for still lifes, product photography, and other industrial and commercial applications. The Type L Film is available only in 120 size and in sheet-film sizes. This professional film is designed for exposures of 1/50 second to 60 seconds with tungsten lamps 3200 K. Its speed at 1/50 second under these conditions is ISO (ASA) 100. You can also use the film in daylight with a No. 85B filter at a speed of ISO (ASA) 64.

KODAK VERICOLOR Slide Film 5072 is a special-purpose color film for printing color slides—positives—directly from color negatives or for photographing artwork to make reverse-text title slides.

To make color slides from your color negatives you can use the film with contact printing techniques in the darkroom or use the film in your 35 mm camera with slide duplicating equipment to photograph your color negatives. To make reverse-text title slides, you can photograph black text or artwork on a white background with a color filter over the camera lens or photograph it on a color background. Because VERICOLOR Slide Film is used normally for making positive transparencies from color negatives, it reverses the tones and produces colors complementary to the original negative. You can create a wide range of background colors in slides by photographing simple black lettering or line art on a white background. This gives you color title slides with white printing or white line art on a color background. Such slides are relatively easy to make.

The film is intended for exposure to tungsten enlarger-lamp illumination using exposure times from ¼ to 8 seconds. The film is sold in 35 mm 100-foot long rolls and in 135-36 exposure magazines. In the 135 size, the film is identified as KODAK VERICOLOR Slide Film SO-279. If your photo dealer doesn't have the SO-279 film, in 135 magazines, the dealer can order it for you using CAT No. 162 2364.

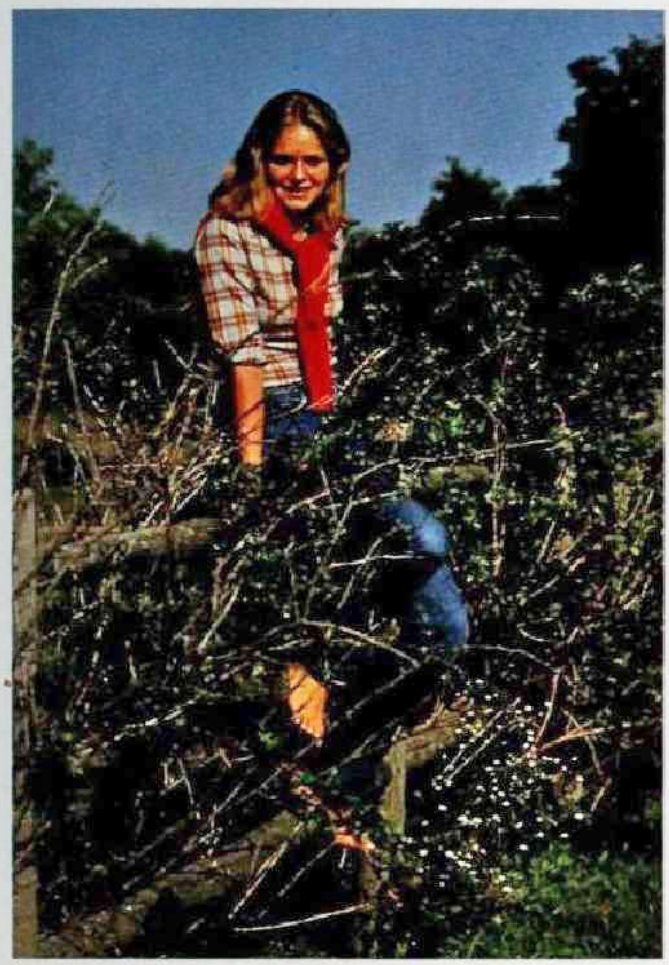
KODAK EKTACHROME 64 Professional Film (Daylight) is the professional version of EKTACHROME 64 Film (Daylight). Both films are very similar except that the professional film is designed for professional use, storage, and handling. It has the same ISO (ASA) 64 film speed. The professional film is available in 135 and 120 sizes and in sheet-film sizes.

For increased accuracy for the professional photographer, the effective speed of a specific emulsion for KODAK EKTACHROME Professional Films is printed on the instruction sheet packaged with the film. The effective speed may be the same as, or plus ⅓ stop, or minus ⅓ stop from the nominal speed. For example, for the 64 speed film, the effective speed can be ISO (ASA) 64, 80, or 50.

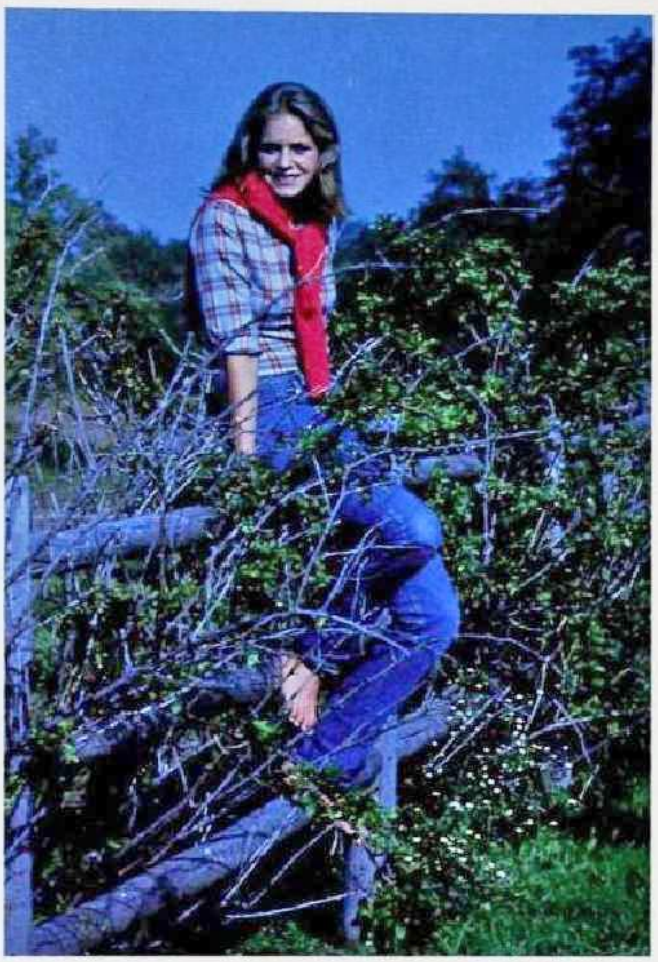
KODAK EKTACHROME 200 Professional Film (Daylight) is the professional version of EKTACHROME 200 Film (Daylight). The professional film is optimized for critical photography requiring professional handling techniques. It has the same speed and other characteristics which are similar to the general-use film. The professional film comes in 135 and 120 sizes and in sheet-film sizes.

KODAK EKTACHROME 160 Professional Film (Tungsten) has the same ISO (ASA) 160 speed as the general-use EKTACHROME 160 Film (Tungsten). Both films are similar in most other respects. The professional film is available in 135 and 120 sizes.

KODAK EKTACHROME 50 Professional Film (Tungsten) is a color-slide film designed for taking pictures with 3200 K tungsten lamps. It has a film speed of ISO (ASA) 50 with this illumination. The fine color quality of this Tungsten film makes it an excellent film for informal portraits, close-ups, title slides, and for copying color originals. You can also use this film to take pictures in daylight by using a No. 85B filter over your camera lens, reducing the film speed to ISO (ASA) 32. You can purchase this film in 135 and 120 sizes.



When you take pictures outdoors with a film balanced for tungsten light, use the recommended conversion filter to obtain proper color balance. EKTACHROME 160 Film (Tungsten) with a No. 85B filter.



JOHN MENIHAN, JR.

If you don't use the recommended filter with Tungsten film outdoors, this is the kind of bluish result you'll get.

COLOR BALANCE

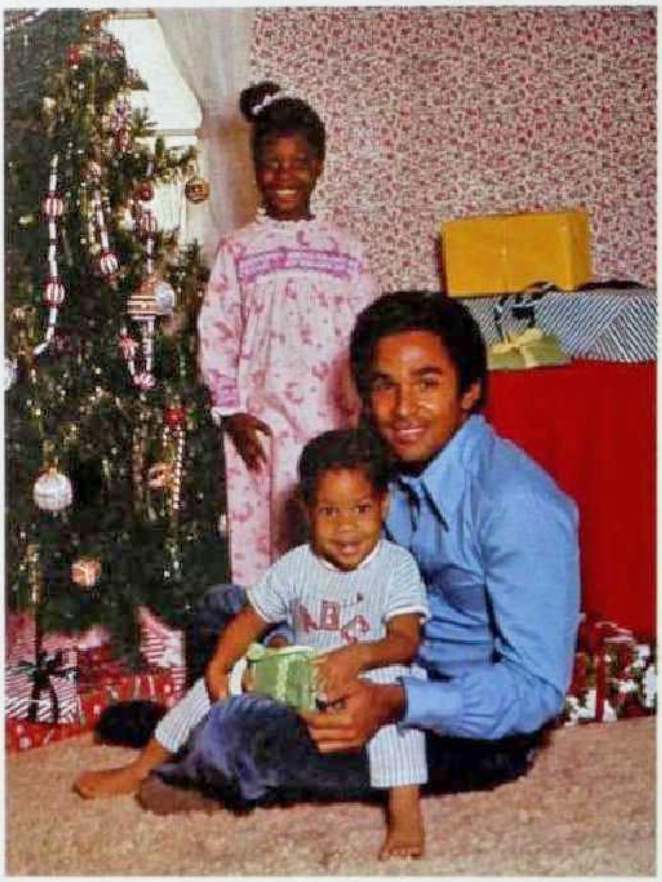
Color balance refers to the ability of a film to reproduce the colors of a scene approximately as the eye sees them. Color films are balanced in manufacture for exposure to light of a certain color quality, such as daylight, 3400 K photolamps, or 3200 K tungsten lamps.

You'll get the best results when you use a film with the kind of illumination for which it's balanced. Usually under these conditions you don't need a filter to obtain correct color rendition. If you use a light source with a color quality different from that for which the film is balanced, you'll need to use the conversion filter recommended in this book or on the film instructions. You can get good results with filters, but most of them absorb light and reduce the effective speed of the film.

Since the film in a slide is usually the original film you expose in your camera, the color rendition depends primarily on the light source and the filter you use when you take the picture. The color balance of prints made from color negatives exposed with the wrong light source usually can be improved somewhat when the prints are made. But if the film was exposed with light sources significantly different from that for which the film is balanced, satisfactory corrections may not be possible.

FLASH PICTURES WITH COLOR FILMS

Electronic flash, blue flashbulbs, flashcubes, magicubes, and flipflash are recommended for taking flash pictures with daylight-type Kodak color films.



G. ABRAMOWITZ

Electronic flash, blue flashbulbs, flashcubes, magicubes, and flipflash are recommended for taking flash pictures with most Kodak films for general use.

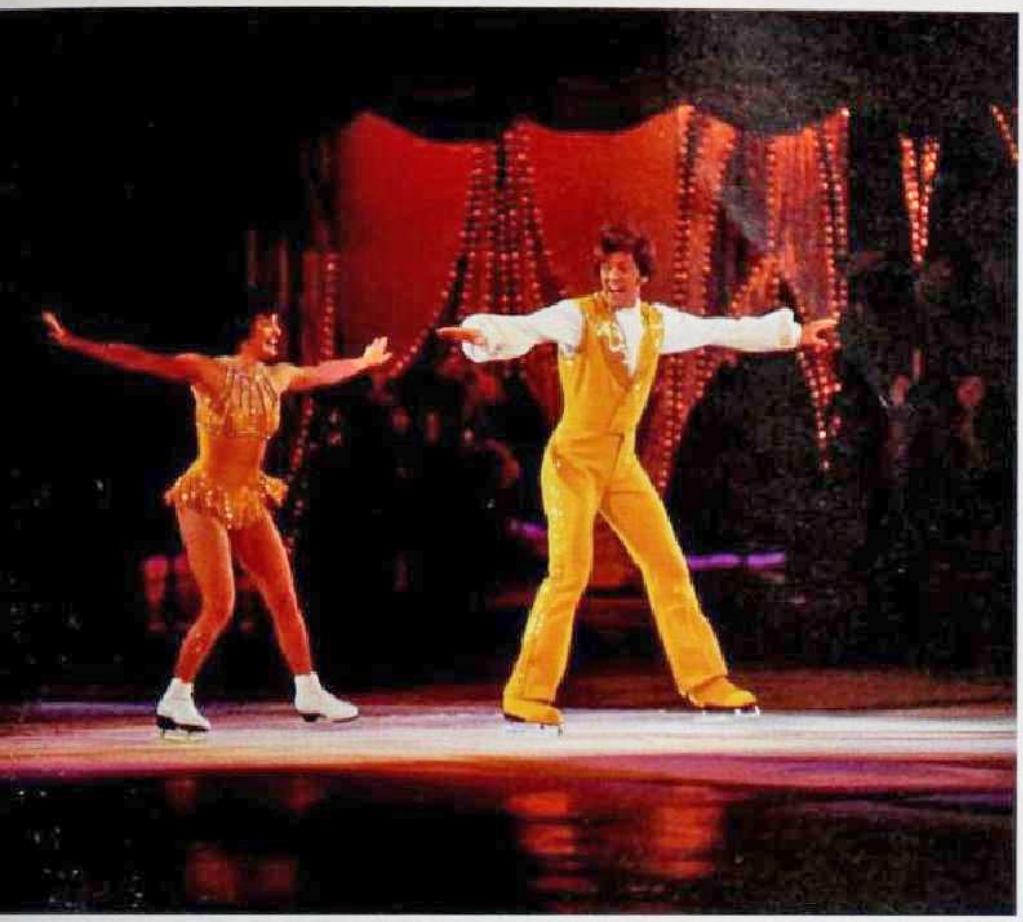
PETE CULROSS

Usually you don't need a filter for taking color pictures with electronic flash. However, if your pictures are consistently too blue, use a No. 81B filter on your camera lens or over the flash reflector to improve the color rendition.

RECOMMENDED FILTERS FOR FLASH

Color Film	Electronic Flash	Blue Flashbulbs, Flashcubes, Magicubes, Flipflash	Clear Flashbulbs	
			25, 26	AG-1, M-3
KODAK Daylight Color Films KODACOLOR II KODACOLOR 400	None*	None	80C	80D
KODAK EKTACHROME 160 (Tungsten)	85B	85B	81EF	85C
KODACHROME 40 5070 (Type A)	85	85	81C	81EF
KODAK EKTACHROME Infrared	12 or 15	12 or 15	—	—

*If your pictures are consistently too blue, use a No. 81B filter.



For taking existing-light color slides with daylight illumination or with carbon-arc spotlights, such as those illuminating this scene at the Ice Follies, use a film balanced for daylight. EKTACHROME 200 Film (Daylight) is excellent for existing light because of its high speed and superb quality.

JOHN MENIHAN, JR.

The color quality of these light sources is similar to that of daylight, and you don't normally need a filter. Electronic flash units do vary, though, and some flash units may produce pictures that are too bluish. If your pictures are consistently too blue, use a No. 81B yellowish filter and increase exposure by ⅓ stop. If you prefer to use clear flashbulbs with daylight film, you'll need a blue conversion filter; see the table on page 42.

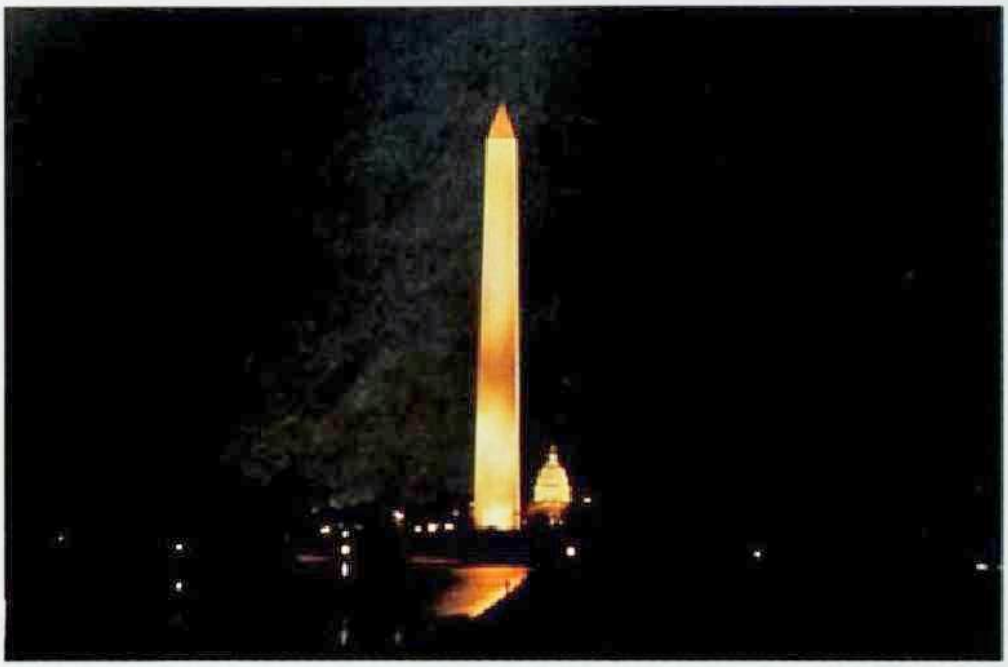
When you want to take flash pictures on EKTACHROME 160 Film (Tungsten) or KODACHROME 40 Film 5070 (Type A), you can use electronic flash, blue flashbulbs, or flashcubes with the proper conversion filter. See the table. If you prefer, you can use clear flashbulbs with the proper filter.

FILMS FOR EXISTING-LIGHT PHOTOGRAPHY

Existing light, sometimes called available light, includes artificial light which naturally exists in the scene, daylight indoors, and twilight outdoors. Technically, daylight lighting conditions outdoors, including bright sunlight, are existing light. But in defining existing light for photography, we are referring to lighting that is characterized by lower light levels than you would encounter in most daylight conditions outdoors. Outdoor scenes after dark or at twilight are considered to be existing-light situations.

Actually you can use all Kodak color films for general use for taking pictures by existing light if you don't mind putting your camera on a tripod or some other firm support and using slow shutter speeds or time exposures in some situations. But your picture-taking will be made much more versatile and convenient if you can handhold your camera and use shutter speeds of 1/30 second or higher. This requires an *f*/2.8 or faster lens and a high-speed film for most subjects, because existing lighting is often quite dim.

This is the modern way to take existing-light pictures—take advantage of today's high-speed lenses and high-speed films by taking candid pictures while handholding your camera. Excellent high-speed films to use are KODACOLOR 400 Film for color prints



JEANNETTE KLUTE

A good choice for outdoor night pictures when you want color slides is EKTACHROME 400 Film (Daylight). Its high speed came in handy for photographing the Washington monument in Washington, D.C. The exposure for this subject would be 1/30 sec *f*/1.7.

KEITH BOAS

KODACOLOR 400 Film, with a very high film speed of ISO (ASA) 400, is an excellent film for existing-light pictures when you want color prints. Stage show at the family fun park, Six Flags, Atlanta, Georgia. 1/250 sec *f*/2

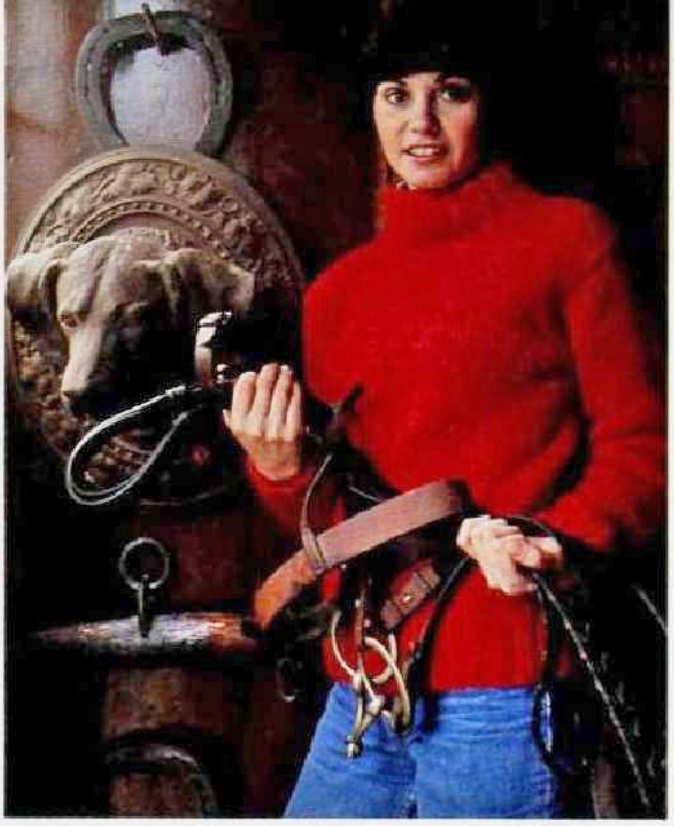
JOHN VAETH

When you use KODACOLOR 400 Film you can get pleasing results in your color prints without using camera filters in a variety of existing-light conditions, such as tungsten household lighting (regular light bulbs), fluorescent illumination, and daylight indoors. 1/60 sec *f*/4

and EKTACHROME 400, 200, and 160 Films for color slides.

Since KODACOLOR 400 Film has special sensitizing characteristics and color rendition can be partially controlled when the prints are made, you can take pictures of good quality in various kinds of existing light without using filters. If you're using color-slide films, such as EKTACHROME Films, the choice between the Daylight film and the Tungsten film depends on the type of lighting and your personal taste.

The Daylight film, of course, is better for indoor scenes illuminated by existing daylight. You can also use it to photograph performers illuminated by carbon-arc spotlights. When you're photographing subjects indoors with fluorescent lighting, Daylight film will give the best results; however, the color rendition of the slides will usually be greenish, depending on the type of fluorescent lamps used. See "Filters for Fluorescent Illumination" on page 47. You can use the Daylight film for existing-light photography outdoors at night, too. The results will be warmer or more yellow-red than if the pictures were made on the Tungsten film. With mercury-vapor lamps used at some sports stadiums and for some street lighting, you'll get the best results on Daylight film. However, your pictures will have a blue-green appearance because mercury-vapor lamps are deficient in red. You can usually identify mercury-vapor lighting by its slightly blue-green appearance in comparison with tungsten light.



DON MAGGIO

Since existing daylight is usually brighter than other kinds of existing light, you can use a medium-speed film, such as EKTACHROME 64 Film (Daylight), depending on your camera.

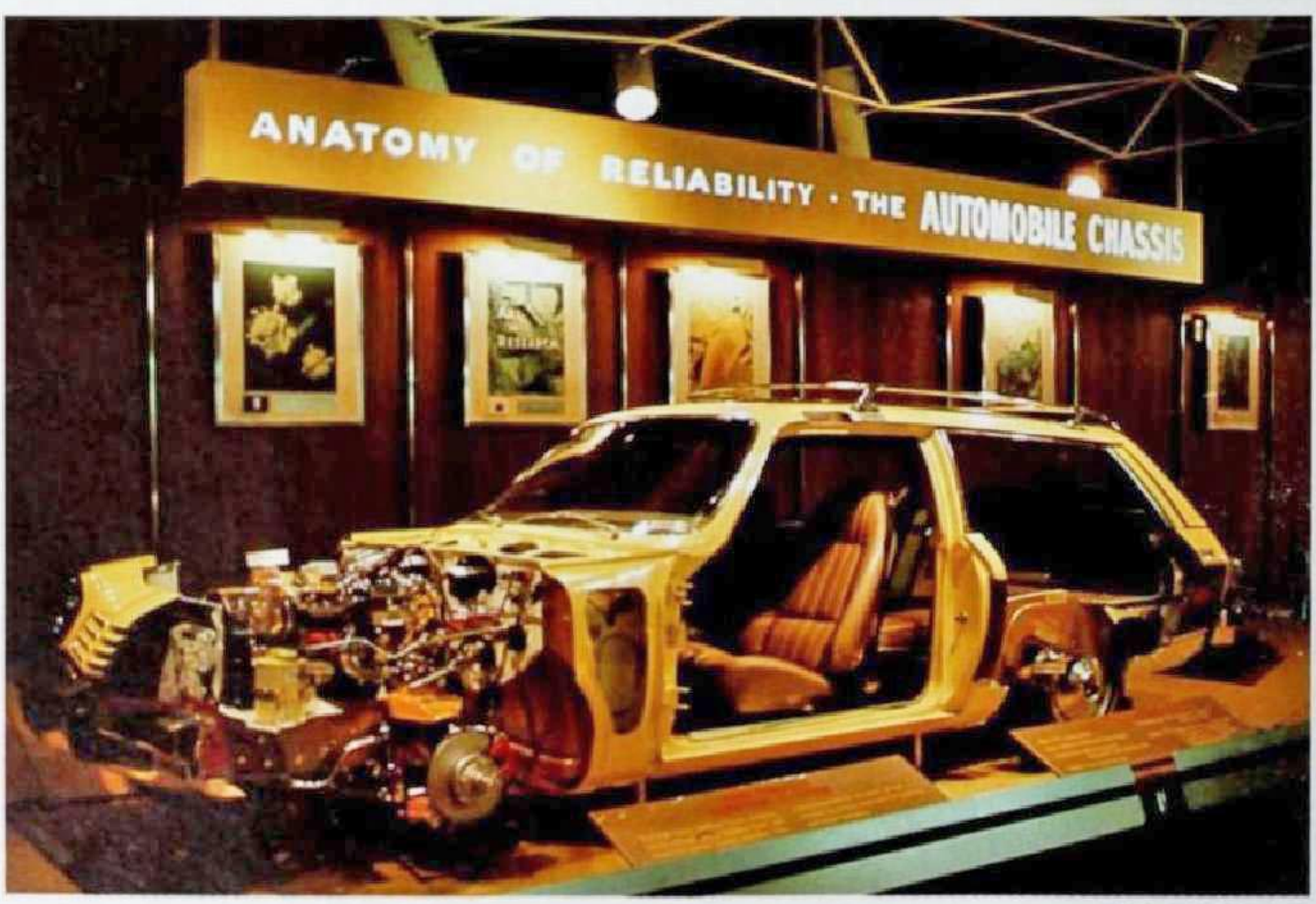
EKTACHROME 160 Film (Tungsten) is excellent for existing tungsten light, such as the light from household lamps and other general-purpose tungsten lamps, when you want color slides. Outdoors at night you can use the Tungsten film for pictures of illuminated buildings, fountains, statues, signs, street scenes, and similar subjects. Slides of such subjects taken on Tungsten film may look more natural than those taken on

When the existing lighting is provided predominantly by tungsten lamps, you'll get more natural-looking color slides by using film balanced for tungsten light. EKTACHROME 160 Film (Tungsten) at Water Tower Place, Chicago, Illinois

CAROLINE GRIMES

ROBERT L. LEAF, JR., KINSA

With an adjustable camera, you can take pictures in existing daylight on KODACOLOR II Film. 1/30 sec *f*/2



CAROLINE GRIMES

Tungsten lighting on EKTACHROME 160 Film (Tungsten). Museum of Science and Industry, Chicago, Illinois.

Daylight film. The type of color-slide film you use for outdoor pictures at night is a matter of personal taste. Both types produce pleasing results.

Sometimes you'll find more than one kind of illumination in the same scene. If one type of light source is predominant, use color-slide film balanced for that light source. For example, in a scene which includes both daylight and tungsten light, daylight is usually the predominant light source and Daylight film would give more pleasing results. If the kinds of illumination in the scene are about equal in intensity and distribution, the choice of color-slide film is a matter of personal taste. If you like warmer-looking, or more yellow-red, pictures, use Daylight film; if you prefer colder-looking, or more blue, pictures, use Tungsten film. Of course, in many situations the choice depends on the type of film that happens to be in your camera.

Since most existing light is dim, you'll often need all the film speed you can get. With KODACOLOR 400 and EKTACHROME 400 Films you have a high film speed of ISO (ASA) 400 which is very helpful in existing-light photography. When you are using EKTACHROME 400, 200, and 160 Films and you need more speed, a real boon to the existing-light photographer is the special processing service for increasing the speed of EKTACHROME Film which was mentioned earlier. See pages 37 and 54 for more information on special processing.

In brighter levels of existing light, such as existing daylight, you can use a fast- or medium-speed film—KODACOLOR II, KODACHROME 64, or EKTACHROME 64 Film.

FILTERS FOR FLUORESCENT ILLUMINATION

Pictures made on daylight-type film without a filter in fluorescent light may be acceptable, although the pictures sometimes have a greenish cast depending on the film and the type of fluorescent tubes in use. Tungsten film without filters usually produces pictures that are much too blue. Generally speaking, it's not practical to use filters in existing-light photography because they absorb too much light and reduce the effective speed of the film. However, when the reduced film speed is acceptable for the type of pictures you want to take, you can improve the color quality of pictures taken under fluorescent illumination by using filters over your camera lens.

Selecting filters for fluorescent illumination is sometimes difficult because the lamps are often inaccessible and therefore hard to identify. There are several kinds of fluorescent lamps, and each kind produces light of a slightly different color. If optimum color rendition is important and you can find out the kind of lamps in use, you can improve the color in your pictures by using the KODAK Color Compensating Filters recommended in the table on page 48. These filters are available from photo dealers.

Since you may have difficulty finding out what kind of fluorescent lamps are in use, you can use a compromise filter. Lamp manufacturers' sales figures show that a large majority of the fluorescent lamps sold are cool white, white, or warm white. Therefore, you can reasonably assume that the lamps in use are one of these three kinds. Recommendations for compromise filters are given in the table for average fluorescent light. These filters are for emergency use when you don't know what type of fluorescent lamp is in use and you can't find out.

For critical work with color-slide film, you should take test pictures using your

FILTERS FOR FLUORESCENT LIGHT

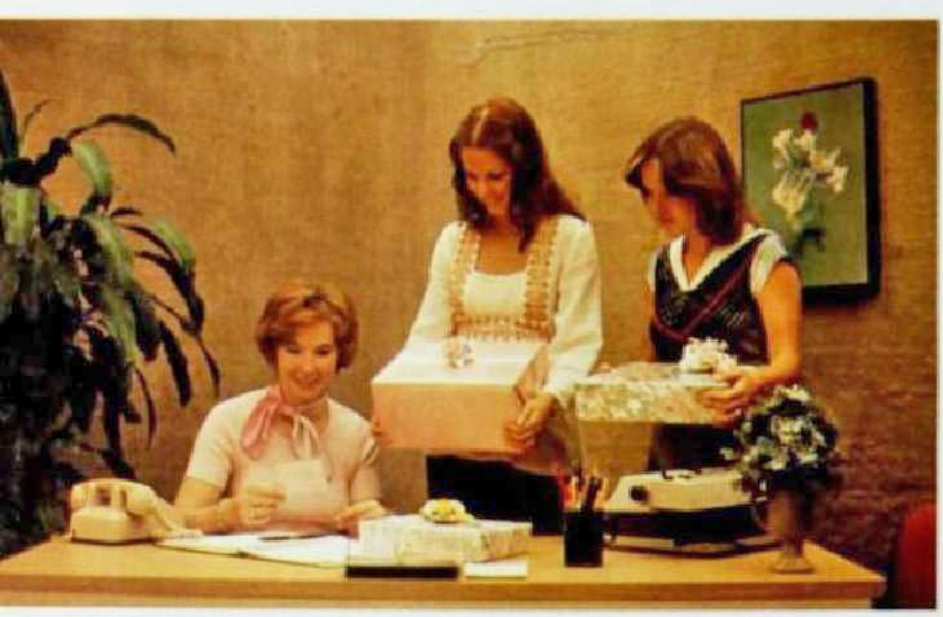
KODAK Color Film

Fluorescent Lamp	KODACOLOR II KODACOLOR 400* KODACHROME 25 (Daylight) EKTACHROME 200 (Daylight)	KODACHROME 64 (Daylight) EKTACHROME 64 (Daylight) EKTACHROME 400 (Daylight)	EKTACHROME 160 (Tungsten)	KODACHROME 40 5070 (Type A)
Daylight	40M + 40Y + 1 stop	50M + 50Y + 1⅓ stops	No. 85B + 40M + 30Y + 1⅔ stops	No. 85 + 40M + 40Y + 1⅔ stops
White	20C + 30M +1 stop	40M + ⅔ stop	60M + 50Y + 1⅔ stops	40M + 30Y + 1 stop
Warm White	40C + 40M + 1⅓ stops	20C + 40M + 1 stop	50M + 40Y + 1 stop	30M + 20Y + 1 stop
Warm White Deluxe	60C + 30M + 2 stops	60C + 30M + 2 stops	10M + 10Y + ⅔ stop	No Filter None
Cool White	30M + ⅔ stop	40M + 10Y + 1 stop	60R + 1⅔ stops	50M + 50Y + 1⅓ stops
Cool White Deluxe	20C + 10M + ⅔ stop	20C + 10M + ⅔ stop	20M + 40Y + ⅔ stop	10M + 30Y + ⅔ stop
Average Fluorescent†	10C + 20M + ⅔ stop	30M + ⅔ stop	50M + 50Y + 1 stop	40M + 40Y + ⅔ stop

Except for the No. 85 and No. 85B filters, the filters suggested for fluorescent illumination are KODAK Color Compensating Filters (CC).

Note: Increase exposure by amount shown in table. *For critical use.

†These filters are for emergency use only, when it's not possible to determine the type of fluorescent lamp in use. Color rendition in pictures taken with these filters will be less than optimum.



DON MAGGIO

For taking color pictures under fluorescent illumination without using a filter, you'll get the best results on daylight film. Although the pictures are usually acceptable, they may have an overall color cast depending on the kind of lamps. EKTACHROME 200 Film (Daylight), no filter

For better color rendition in photographs of subjects brightly illuminated by fluorescent light, use the filters recommended in the table above. With cool white deluxe fluorescent lamps and EKTACHROME 200 Film (Daylight) the recommended filters are CC20C + CC10M.

film with the filters recommended in the table for each type of lamp, and with filters that vary at least plus and minus CC10M and CC10Y from the filters listed. Color-negative film, such as KODACOLOR Film, is a good choice for taking pictures under fluorescent illumination because color rendition can usually be improved when your negatives are printed. KODACOLOR 400 Film with its special sensitizing characteristics is especially good for fluorescent lighting. With this film, you do not normally need to use filters with fluorescent light unless the results are for critical use.

In general with fluorescent lamps, use a shutter speed of 1/30 second or slower to avoid uneven exposure or underexposure due to the flicker in brightness of the lamps. This is caused by the 60-cycle alternating current and is not apparent to the eye.

For more information on taking pictures by existing light, you can purchase the Kodak book *Adventures in Existing-Light Photography* (AC-44), from your photo dealer and bookstores. See the inside back cover.

FILMS FOR PHOTOLAMP ILLUMINATION

You may want to take some indoor portraits of your family or friends, photograph small objects close up, or make title slides for your slide shows. Excellent light sources for these subjects are the various types of photolamps sold by photo dealers. Generally, lamps are available in two color temperatures designated 3400 K and 3200 K. The advantage of using photolamps is that it's so easy to control the light. You can see the lighting and make corrections before you take the picture and you can use your exposure meter to determine exposure.

When you want the highest quality and you don't need a high-speed film, KODACHROME 40 Film 5070 (Type A) is the best choice for color slides. You can use this slide film with 3400 K photolamps without a filter. To use 3200 K tungsten lamps with the Type A film, see the table on the next page for the recommended filter and film speed.

WALTER LEE

Photolamps let you see the lighting and adjust the lights before you take the picture, so it's easier to obtain high-quality results. KODACHROME 40 Film 5070 (Type A) with 3400 K photolamps

If you need a high-speed color-slide film, an excellent choice is KODAK EKTACHROME 160 Film (Tungsten), which requires no filter when you expose it by 3200 K illumination. You can also take pictures using 3400 K lamps when you use the proper filter; see the table.

You can take pictures on Daylight film under photolamp illumination, but the conversion filters absorb a lot of light and reduce the speed of the film considerably, as shown by the table. So when you want color slides, it's better to use Type A or Tungsten film under these conditions. If you want color prints of subjects lighted by photolamps, KODACOLOR II Film exposed with the filter recommended in the table will give you excellent results.

FILTERS AND ISO (ASA) FILM SPEEDS FOR PHOTOLAMPS

KODAK Color Film	3400 K Photolamps	3200 K Tungsten Lamps
KODACHROME 40 5070 (Type A)	None **40**	No. 82A **32**
EKTACHROME 160 (Tungsten)	No. 81A **125**	None **160**
KODACOLOR II	No. 80B **32**	No. 80A **25**
KODACOLOR 400	No. 80B* **125**	No. 80A* **100**
KODACHROME 25 (Daylight)	No. 80B **8**	No. 80A **6**
KODACHROME 64 (Daylight)	No. 80B **20**	No. 80A **16**
EKTACHROME 64 (Daylight)	No. 80B **20**	No. 80A **16**
EKTACHROME 200 (Daylight)	No. 80B **64**	No. 80A **50**
EKTACHROME 400 (Daylight)	No. 80B **125**	No. 80A **100**
EKTACHROME Infrared	No. 12 or 15 + CC50C-2 **50**	—

*Filter recommendations for critical use.

Note: Numbers in heavy type are film speeds. If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

FILMS FOR COPYING

For copying originals such as photographs (prints), drawings, documents, and paintings, choosing a color film is much the same as for conventional subjects. The choice depends on whether you want prints or slides and on the type of illumination.

You can use any of the light sources recommended for the film, such as daylight, flash (used off the camera if there are reflecting surfaces), or photolamps. However, since most copies are close-ups, photolamps are usually the best choice because they make it easier to control the illumination, and you can use your exposure meter to determine exposure. See "Using Exposure Meters in Copying," page 105. If you use photolamp illumination, film recommendations for copying are the same as those under "Films for Photolamp Illumination."

If your original is black-and-white, you can obtain good copies on color film. However, if you want a monochromatic image that is a more accurate reproduction of the original or if you have many copies to make, it may be better or more economical to use black-and-white film. See page 79. Also, see the note about copyrighted material on page 80.

FILMS FOR DUPLICATING COLOR SLIDES

When you want to make duplicate slides of color-slide originals made on such films as KODACHROME and KODAK EKTACHROME Films, you'll usually get

NEIL MONTANUS

KODACHROME Films are well known for their outstanding definition characteristics. KODACHROME 64 Film (Daylight). 1/125 sec *f*/8

the best results when you use a film specifically designed for duplicating. KODAK EKTACHROME Slide Duplicating Film 5071 (Process E-6) and KODAK EKTACHROME SE Duplicating Film SO-366 are made for this purpose. These films have low contrast and color rendition characteristics suitable for producing excellent slide duplicates.

You can use conventional color-slide films for making duplicate slides, but the duplicates made with such films are generally less than satisfactory due to contrast that's too high, some loss in color saturation that may be evident, and possible loss of image sharpness. Sometimes if you have an original slide that would be better with increased contrast, you can duplicate it on a conventional color-slide film such as KODACHROME 25 Film (Daylight) and get good results. A duplicate slide made on this film will usually have increased contrast.

DEFINITION

Definition is the clarity of detail seen by a person when viewing a photograph. Several factors give you the impression of definition. The degree of graininess, resolving power, and sharpness are usually used to describe a film's definition characteristics. Classifications for each of these definition factors have been assigned to Kodak films for general use. See the Definition Tables in the Data Sheets. A more thorough discussion of definition is given on page 72 in the chapter "KODAK Black-and-White Films."

Since the "Degree of Enlargement" classification described on page 75 applies to prints, this classification is not given in the Data Sheets for color-slide films. When color prints are made from color slides, the degree of enlargement depends on the method used to make the prints; i.e., through internegatives or directly on reversal color-printing paper. Definition classifications are not provided for KODAK Instant Color Film because they would not be meaningful for comparing this film with a negative or slide film.

RECIPROCITY CHARACTERISTICS

Most color films are designed for the typical short exposure times used in general picture-taking. At exposure

KODAK Mailers, sold only in the U.S.A., are convenient to use because you can mail your Kodak color film directly to Kodak for processing. After your pictures are processed, they are mailed to any address you specify.

DON MC DILL

Kodak chemicals for processing KODAK EKTACHROME and KODACOLOR Films are available from photo dealers in handy kit form. Each kit contains the chemicals you need plus complete instructions.

times of 1 second or longer, the speed of most films will begin to decrease and color rendition will shift away from normal. These changes are referred to as the "reciprocity characteristics" of the film.

You can correct for the reciprocity effect by using filters and increasing the exposure. Recommended corrections for critical work are given on the Data Sheet for each Kodak color film. In most existing-light situations it's not practical or essential to use filters, but you can increase exposure to compensate for the decrease in film speed. You can avoid the effect simply by using shutter speeds shorter than 1 second when it's practical (shorter than 1/10 second with KODACOLOR, KODAK EKTACHROME Infrared, and KODAK Instant Color Films).

Generally, when applying the exposure compensation to correct for reciprocity effect, it's better to use a larger lens opening to increase exposure rather than use a longer exposure time. Making the exposure time even longer would compound the reciprocity problem. If necessary for large corrections, you can apply part of the exposure compensation to the lens opening and the rest to the exposure time.

PROCESSING

Have your film processed promptly after exposure. Return Kodak color film to your photo dealer for processing by Kodak or another laboratory, or mail it directly to Kodak in the appropriate KODAK Mailer for prepaid processing. The processing comments made here do not, of course, apply to KODAK Instant Color Film. For developing this film, see page D 7.

You can process KODACOLOR and KODAK EKTACHROME Films yourself in processing kits sold by photo dealers. All the necessary chemicals and instructions for processing the film are included in the kits. See pages 80-82 in the black-and-white film section for information on film tanks and agitation procedures for film processing. For information on processing and printing Kodak color films, see your photo dealer or write to Eastman Kodak Company, Photo Information, Department 841, 343 State Street, Rochester, New York 14650, and request the

pamphlet *Introduction to Processing and Printing* KODAK *Color Films* (AE-12). For prompt delivery of the pamphlet, please send a self-addressed business-size envelope with the publication title and number written on the back. We'll pay the postage. This applies only to the U.S.A. In foreign countries contact the normal source for Kodak products in that country.

Processing KODACOLOR II and KODACOLOR 400 Films. To process these films, you can use the KODAK FLEXICOLOR® Processing Kit (Process C-41) or the equivalent. The processing steps given here are to familiarize you with processing KODACOLOR Film. Complete instructions come with the processing kit.

Process C-41 requires 7 steps that take 24¼ minutes, not including the time it takes for your film to dry. The temperature of the developer for the first step must be 100°F ± ¼ (37.8°C ± 0.15). The other solutions and the wash water should be within a range of 75 to 105°F (24 to 40.5°C). The processing steps and the time in each solution in minutes are as follows:

1. Developer—3¼*
2. Bleach—6½
3. Wash, running water—3¼
4. Fixer—6½
5. Wash, running water—3¼
6. Stabilizer—1½
7. Dry

*Increase development time after processing the specified quantity of film as recommended in the chemical instructions.

After your color negatives are processed, you can have prints made through your photo dealer or you can make them yourself. If you want to make your own color prints and have questions about the procedure, write to Kodak at the address given above. You can purchase Kodak books on making color prints—*Color Printing Techniques* (KW-16) and *Basic Developing, Printing, Enlarging in Color* (AE-13)—from your photo dealer and bookstores.

Processing KODAK EKTACHROME 64, 160, 200, and 400 Films and EKTACHROME Slide Duplicating Film 5071 and EKTACHROME SE Duplicating Film SO-366. To process these films, you can use the KODAK EKTACHROME Film Processing Kit, Process E-6, or equivalent. Process E-6 has 11 steps and takes 37 minutes, not including the time it takes for your film to dry. The temperature of the first developer must be 100°F ± ½ (37.8°C ± 0.3). The color developer must have a temperature of 100°F ± 2 (37.8°C ± 1.1). The reversal bath and the conditioner should be within a range of 75 to 102°F (24 to 39°C). The bleach, fixer, stabilizer, and wash water should be within a range of 92 to 102°F (33 to 39°C). Instructions are provided in the processing kit. The steps in the process and the time in each solution in minutes are as follows:

1. First Developer—7*
2. Wash—1
3. Wash—1
4. Reversal Bath—2
5. Color Developer—6
6. Conditioner—2
7. Bleach—7
8. Fixer—4
9. Wash, running water—6
10. Stabilizer—1
11. Dry

*Increase time in first developer after processing the specified quantity of film as recommended in the chemical instructions.

If you want to process EKTACHROME Infrared Film, you have to use a different process. For the Infrared film, use KODAK EKTACHROME Film Processing Chemicals, Process E-4, or equivalents. The E-4 process has 13 steps and takes 56 minutes. Processing instructions are included with the color developer. It is important that you use the specific

process recommended for the kind of EKTACHROME Film you're using. Do not process EKTACHROME Films for Process E-6 in Process E-4 or vice versa.

Handling color film during processing is much the same as handling black-and-white film (see page 80). The main differences are that different processing chemicals are required for color, there is a greater number of steps in the color process, and some of the processing solutions must be very close to the recommended temperature as indicated on page 53. Color processing has to be precise for satisfactory results, so carefully follow the instructions that come with the chemicals. The Kodak book AE-13, mentioned previously, provides information on how to process Kodak color films.

SPECIAL PROCESSING FOR INCREASED SPEEDS

When lighting conditions are dim, as in many existing-light scenes, you may need higher film speed for taking pictures while handholding your camera, stopping action, using a telephoto lens, or using a small lens opening to gain greater depth of field. You can increase the speed of KODAK EKTACHROME 400, 200, and 160 Films (or KODAK EKTACHROME 64 Film when necessary) by obtaining special processing from Kodak, by sending your film to another laboratory, or by extending the development if you process the film yourself. The effective speeds of the films are increased to 2 times the normal speeds. The speed of EKTACHROME 400 Film (Daylight) is increased to ISO (ASA) 800, the speed of EKTACHROME 200 Film (Daylight) to ISO (ASA) 400, and the speed of EKTACHROME 160 Film (Tungsten) to ISO (ASA) 320. The speed of EKTACHROME 64 Film (Daylight) is increased to ISO (ASA)125.

This special processing service by Kodak is not available in most foreign countries. Other processing laboratories may offer the service.

To obtain the special processing from Kodak, purchase a KODAK Special Processing Envelope, ESP-1, sold only in the United States, for *each* roll of EKTACHROME 400, 200, or 160 Film (or EKTACHROME 64 Film), 135 and 120 sizes. The charge for special processing is in addition to the regular cost of KODAK EKTACHROME Film processing. Expose the entire roll of film according to the instructions that come with the ESP-1 Envelope. Put the roll of exposed film into the ESP-1 Envelope, and then either take the film to your photo dealer for processing by Kodak, or mail it in the appropriate KODAK Mailer to a Kodak Processing Laboratory in the United States.

If you want to process the film yourself to obtain increased speed, simply increase the normal first-development time by the amount given in the table on the next page. For all the other steps, follow the normal processing times given in the instructions that come with the chemicals. Also, see page 53. When you process your own films, you can change their effective speeds over a wide range, as shown in the table. Exposing and processing the film at speeds other than the normal speed will result in some reduction in photographic quality. The more the speed of the film is varied from normal, the greater the reduction in quality.

Push processing is not recommended for Kodak color negative films, such as KODACOLOR II and KODACOLOR 400 Films. Overdevelopment of color negative film does not significantly increase the speed of the film, but does cause adverse photographic results. A high fog level is produced which diminishes shadow detail, contrast is increased, and color rendition errors are generated which can't be corrected during printing.

PROCESSING ADJUSTMENTS FOR DIFFERENT SPEEDS WITH *KODAK EKTACHROME* FILM PROCESSING CHEMICALS, PROCESS E-6

ISO (ASA) Film Speed				Change the time in the first developer by
KODAK EKTACHROME 400 Film (Daylight)	KODAK EKTACHROME 200 Film (Daylight)	KODAK EKTACHROME 160 Film (Tungsten)	KODAK EKTACHROME 64 Film (Daylight)	
1600	800	640	250	+ 5½ minutes
800	400	320	125	+ 2 minutes
Normal 400	Normal 200	Normal 160	Normal 64	Normal
200	100	80	32	− 2 minutes

GETTING PRINTS OR SLIDES MADE— FROM YOUR NEGATIVES, PRINTS, OR SLIDES

COLOR PRINTS

When you want color prints or enlargements made from your color negatives, see your photo dealer. The dealer can order the prints for you. When they're made by a Kodak Processing Laboratory, the color prints from these negatives are called KODAK Color Prints, and the enlargements are called KODAK Color Enlargements. From 35 mm color negatives, you can obtain 4 x 6-inch color prints which are larger than the standard size. When these prints are made by Kodak, the service is called MAGNAPRINT35™ Service.

You can also have color prints and enlargements made directly from finished color prints. This service is especially suitable for obtaining extra prints from instant color prints. When made by Kodak, the prints are called KODAK Color Copyprints; the enlargements, KODAK Color Copy Enlargements.

Your photo dealer can have color prints or enlargements made from your color slides, too. When they're made by a Kodak Processing Laboratory, the prints are called KODAK Color Prints and the enlargements, KODAK Color Enlargements.

COLOR SLIDES

When you want duplicates of your slides or transparencies, you can have them made by Kodak or another laboratory. See your photo dealer. They are called KODAK Color Slide Duplicates when made by a Kodak Processing Laboratory.

You can have color slides made from your Kodak color negatives, except for size 110. These slides are called KODACOLOR Slides when made by Kodak Processing Laboratories. You can also have color slides made from your color prints. When Kodak makes these slides, they are called KODAK Color Copy Slides.

COLOR NEGATIVES FROM COLOR SLIDES OR COLOR PRINTS

If you do your own darkroom work and you want color prints from color slides or additional color prints from original color prints when you don't have the original negatives, you can make color prints from color negatives made from the slides or prints. Kodak Processing

Laboratories and other laboratories will produce these color negatives for you so that you can then make your own prints. When Kodak makes the negatives they are called KODAK Color Negatives if made from color slides and KODAK Color Copy Negatives if made from color prints.

You can also produce your own color negatives from color slides or from color prints, or you can print color slides directly on color photographic paper manufactured for this purpose. See the Kodak address on the inside back cover if you want information on these techniques.

JOHN FISH

When you want to make your own black-and-white prints from your color negatives, you can use KODAK PANALURE Paper. This picture was printed on PANALURE Paper.

BLACK-AND-WHITE PRINTS

If you want black-and-white prints from your color negatives, you can make them on KODAK PANALURE Paper, which is specially designed for this purpose. Instructions are included with the paper. To make black-and-white prints from color slides, you'll need to make a black-and-white negative from each slide first. If you have questions about this procedure, write to the address given inside the back cover.

KODACOLOR Films

Kodak
COLOR FILMS
for Prints,
Slides, and
Enlargements

KODACHROME or
KODAK EKTACHROME Films

KODAK Instant
Color Film

KODAK Color Prints
and Enlargements
(made by Kodak)

KODACOLOR Slides
(made by Kodak)*

Color Negative

Prints on KODAK
EKTACOLOR RC Paper

Black-and-white prints
on KODAK PANALURE Paper

*Not available from 110-size KODACOLOR Film

KEVIN R. SCHOCHAT, KINSA

KODAK Color Prints
and Enlargements
(made by Kodak)

Color Slide

KODAK Color Slide Duplicates
(made by Kodak)

DON MAGGIO

KODAK Color Copyprints
and Copy Enlargements
(made by Kodak)

Color Print

KODAK Color Copy Slides
(made by Kodak)

PETER PAPADOPOLOUS

Photo page 58—PAUL W. LEBHARDT

Kodak Black-and-White Films

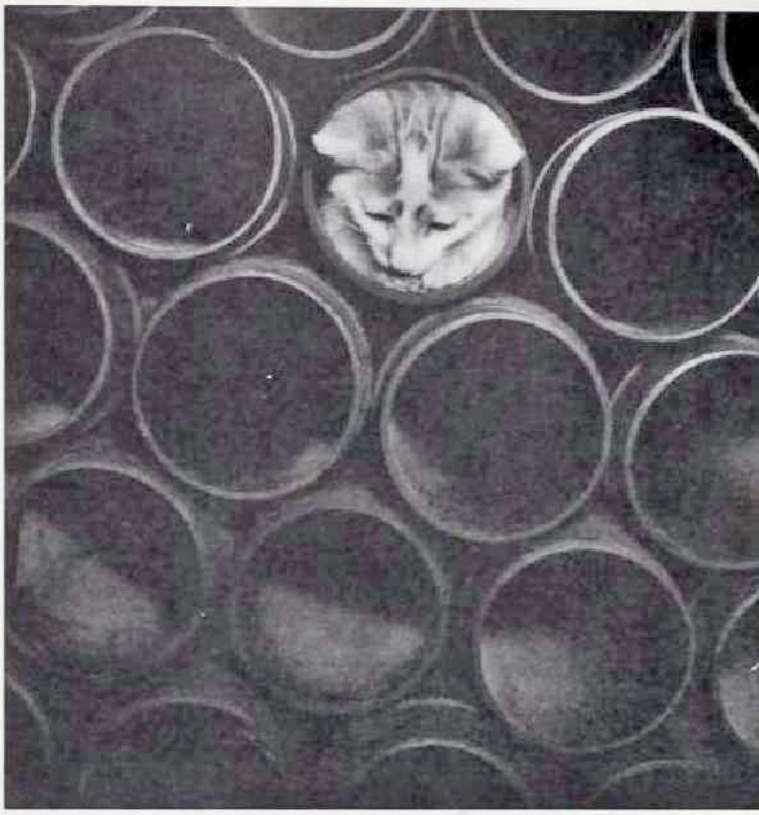
The most important considerations in selecting a black-and-white film for conventional photography, as mentioned before, are the film speed that's best for the kind of pictures you want to take, and the definition quality you'll obtain. A few films are designed for special purposes, such as recording infrared radiation and copying printed material.

A table listing Kodak black-and-white films is given on page 129.

FILMS FOR GENERAL USE

KODAK VERICHROME Pan Film is a fast, all-purpose film which performs beautifully indoors or out, in good light and on overcast days. This panchromatic film has extremely fine grain and excellent definition. It has a speed of ISO (ASA) 125, which is just right for most situations, and superb exposure latitude.

VERICHROME Pan Film is a good choice for general picture-taking with all types of roll-film and cartridge cameras ranging from simple, nonadjustable cameras to the most advanced models. Most other Kodak black-and-white films require an adjustable camera for proper exposure. The film comes in most popular sizes except 135 size. For 35 mm cameras, a very similar film is available —KODAK PLUS-X Pan Film.



MICHAEL J. LACWITA, KINSA

LOUIS MANCUSO, SKPA*

KODAK VERICHROME Pan Film, with a speed of ISO (ASA) 125 and extremely fine grain, is an excellent general-purpose film. It will suit your needs ideally for most black-and-white pictures.

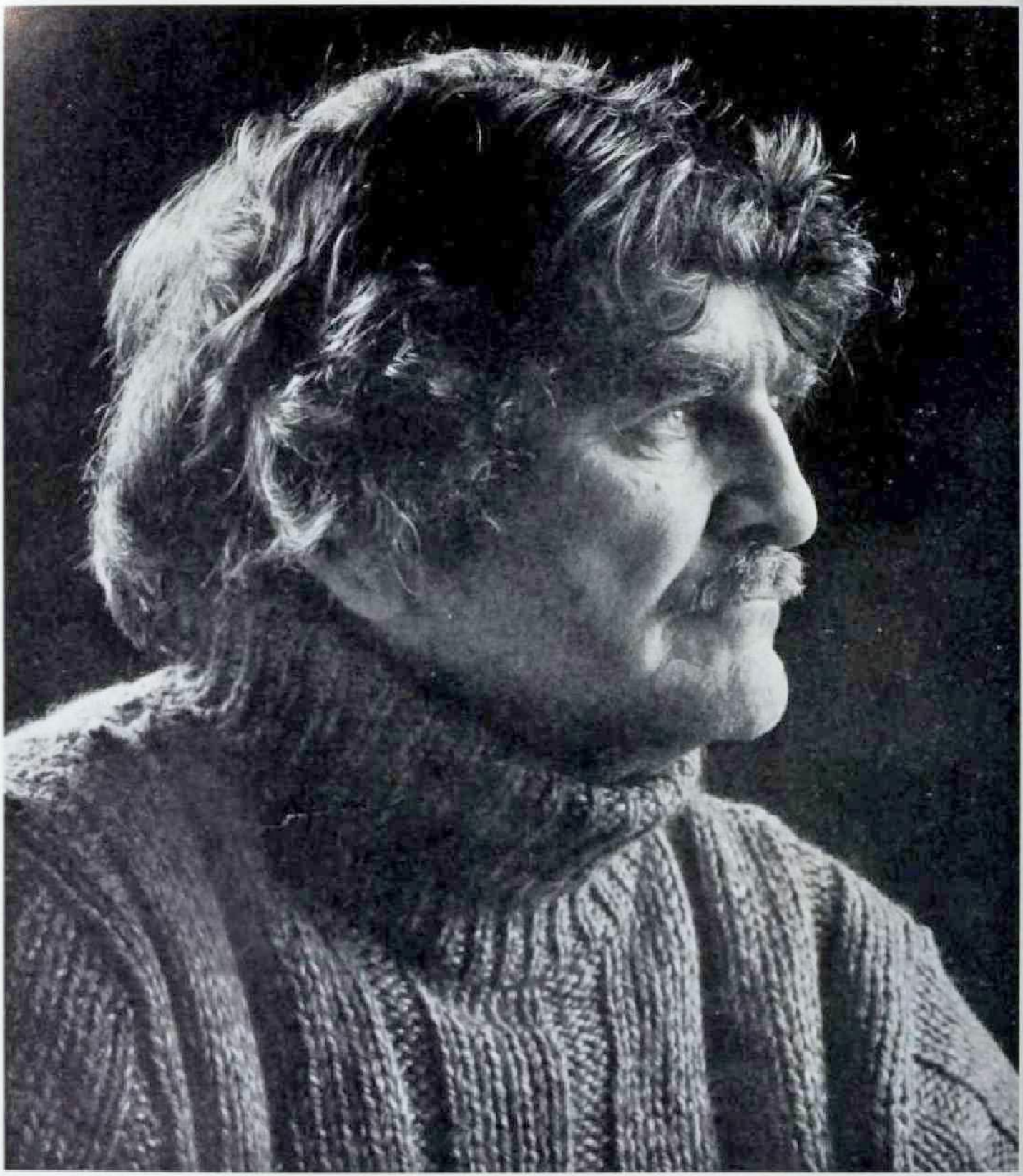
*Courtesy Scholastic/Kodak Photography Awards

KODAK PLUS-X Pan Film, 1/500 sec *f*/8

WALLENCHECK, KINSA

Photo page 59, **KODAK TRI-X Pan Film**

PAUL J. GOLDMAN, KINSA



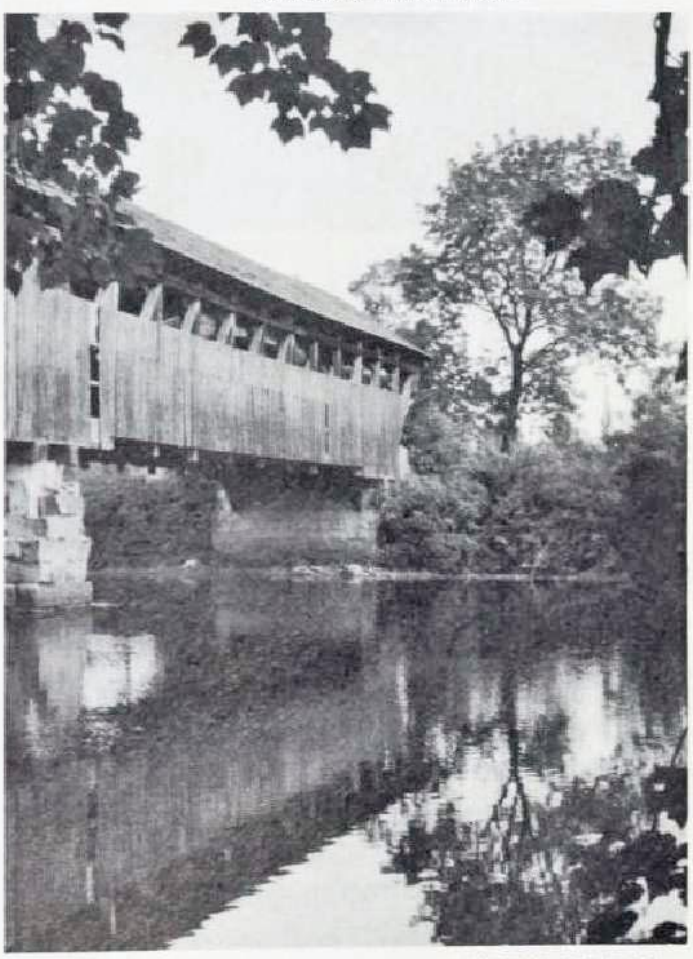
DON MAGGIO

KODAK PLUS-X Pan Film has many of the same fine characteristics as KODAK VERICHROME Pan Film. PLUS-X Pan Film is for use in 35 mm cameras.

KODAK PLUS-X Pan Film is a general-purpose panchromatic film featuring extremely fine grain, very high sharpness, and high enlargeability—almost as good as KODAK PANATOMIC-X Film. PLUS-X Pan Film has higher speed—ISO (ASA) 125—which makes it suitable for use in most lighting conditions except poor light. The film has excellent latitude so it's forgiving when exposure is less than optimum. It has finer grain than KODAK TRI-X Pan Film. PLUS-X Pan Film's combination of fast speed, excellent definition, and beautiful tonal qualities makes it a good choice for all around picture-taking. The film is available in 135 size.

WILLIAM J. FIORE, KINSA

KODAK PANATOMIC-X Film. This film, which has excellent definition characteristics, is designed for making prints with a very high degree of enlargement.



ROBERT KRETZER

KODAK PANATOMIC-X Film combines extremely fine grain with very high sharpness and very high resolution with film emulsion characteristics ideally suited for a very high degree of enlargement. Its film speed of ISO (ASA) 32 is sufficient for many picture-taking situations. It has panchromatic sensitizing. This film is a good choice when image definition quality for high magnification is the main consideration.

With special reversal processing, the 135-size film will produce black-and-white positive slides. In 120 size, the film is called KODAK PANATOMIC-X Professional Film.

ROBIN TRUMAN, SKPA

KODAK TRI-X Pan Film is well known as a top-notch film for existing-light pictures. Its high speed of ISO (ASA) 400 is especially helpful in the comparatively dim lighting conditions usually found in homes.

KODAK TRI-X Pan Film is a high-speed panchromatic film with fine grain and excellent sharpness. The combination of very high speed—ISO (ASA) 400, very good definition characteristics, and wide exposure latitude makes TRI-X Pan Film an excellent choice for photographing dimly lighted subjects, fast action, and subjects requiring good depth of field and high shutter speeds. It also extends the distance range for flash pictures. This film has great flexibility because it lets you take pictures under a wide range of subject and lighting conditions from bright light to dim light, depending on your camera.

JOHN O. KAPLAN, KINSA

KODAK TRI-X Pan Film features excellent tone reproduction—tonal separation is superb and highlights are brilliant—and high-quality definition in addition to its high speed. These qualities make it a very popular and outstanding film.

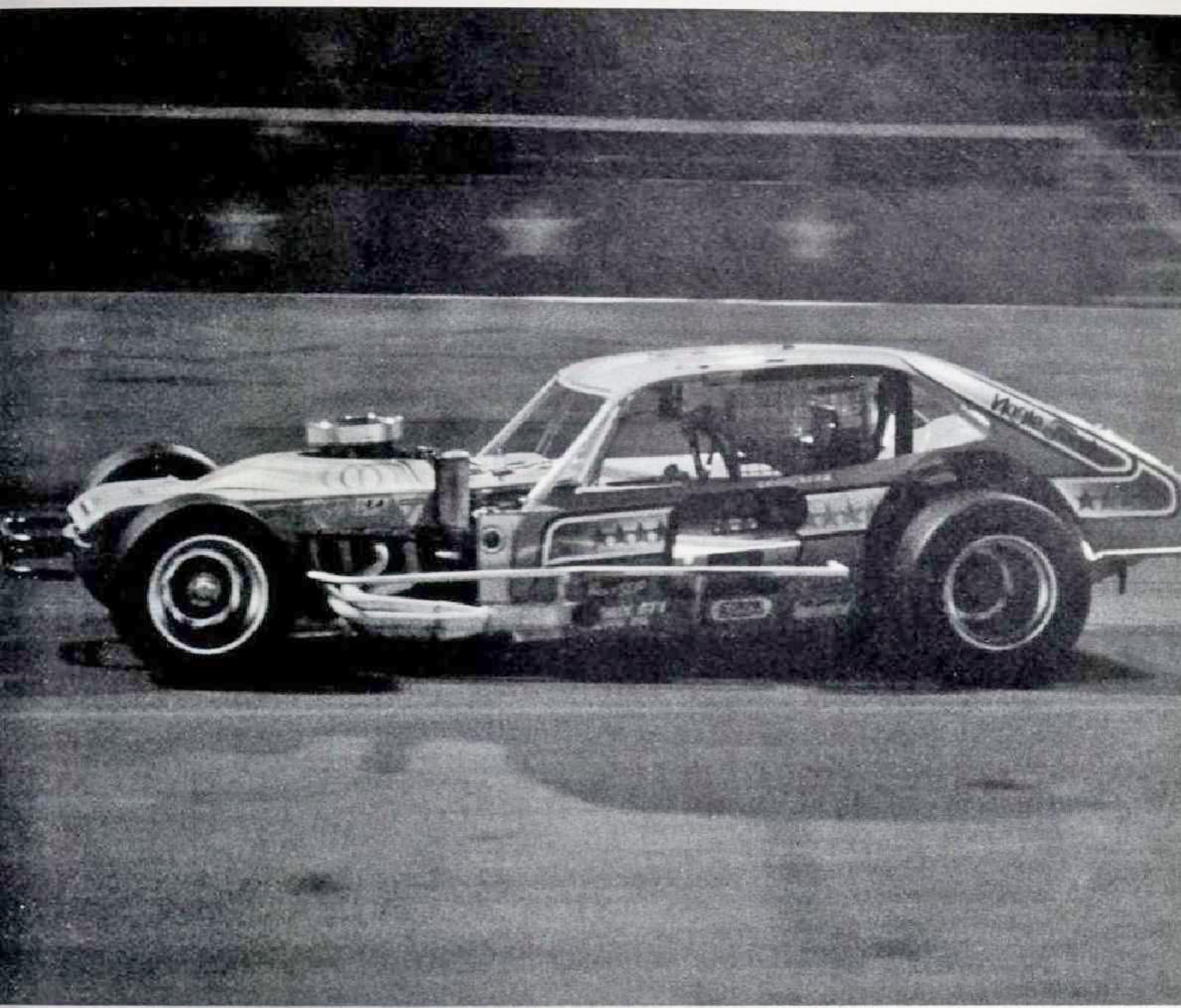
MARK CHRISTIAN PEDERSON, SKPA

KODAK TRI-X Pan Film is a great film for photographing sports. Its high speed lets you use the high shutter speeds necessary to stop motion in existing-light pictures. 1/250 sec *f*/1.8

JOHN MENIHAN, JR.

KODAK ROYAL-X Pan Film with its extremely high speed is a good choice for sports photography at night. 1/250 sec *f*/4

KODAK ROYAL-X Pan Film is an extremely high-speed panchromatic film. This film, for 120-size cameras only, is designed for situations in which you need the highest film speed, as in taking action photographs by existing light or taking pictures when the light is very poor. This film, because of its extremely high speed—ISO (ASA) 1250—is somewhat grainier than the slower films, but its medium grain is usually acceptable in the type of pictures for which the film is designed. Also, since negatives on 120-size film are larger than those from smaller film sizes, the negatives don't have to be enlarged as much for printing which minimizes the impression of graininess.



JOHN MENIHAN, JR.

Here's a picture-taking situation with adverse conditions—fast action photographed with a telephoto lens at night. These conditions require an extremely high-speed film such as KODAK ROYAL-X Pan Film or KODAK Recording Film 2475. The choice between these two films depends on the size of film your camera accepts. Photographed on **KODAK Recording Film 2475**, 1/250 sec *f*/2.5

KODAK Recording Film 2475 is an extremely high-speed film with extended red sensitivity (see page 70). This film is designed for taking pictures in low-light levels with higher than normal shutter speeds or with wide-angle, telephoto, or zoom lenses that do not have high lens speed. Recording Film 2475 is for 35 mm cameras, and you can use it for the same purposes as ROYAL-X Pan Film. It has coarse grain because of its exceptionally high speed—1000. Use this film only in situations where the extra speed is more important than fine grain.

PETER GALES

For an eerie, abstract quality in architectural or landscape photographs, take your pictures on **KODAK High Speed Infrared Film 2481** with a No. 25 filter. 1/60 sec *f*/16

KODAK High Speed Infrared Film 2481 is a fast, moderately high-contrast film that's sensitive to infrared radiation. With this film and the recommended filter, you can create some striking and unusual photographs of subjects such as landscapes and architecture. In infrared photographs the sky appears almost black; shadows are dark, but usually show adequate detail; live grass and leaves appear very light, as though covered by snow; and distant details obscured by haze in the original scene show up with remarkable clarity. By using a flash unit with the proper filter you can photograph subjects in the dark without their being aware of it. This film has many applications for technical and scientific photographs.

You can take pictures on High Speed Infrared Film with daylight, electronic flash, clear flashbulbs, and photolamps with the recommended filter. See pages D 38 and D 39.

The film has an approximate tungsten speed of 125 with a No. 25 filter. The high speed is valuable for taking pictures with a handheld camera in relatively dim light and for stopping motion in photographs of subjects that require high shutter speeds. This film has fine grain, but it is not intended for high degrees of enlargement. The negatives can be printed on conventional black-and-white photographic papers.

Conventional rendering on KODAK PLUS-X Pan Film, no filter. 1/125 sec *f*/16

Normal appearance

Because of the sensitivity of High Speed Infrared Film, cameras must be loaded and unloaded in total darkness; no safelight should be used. Store 135 magazines of this film in the tightly closed film cans or in total darkness.

Camera lenses do not focus infrared rays in the same plane as visible light rays. Some camera lenses have index marks on their focusing scales for infrared focus. If your lens does not have an infrared focusing mark, focus on the near side of the main subject and use a small lens opening. See page D 38.

KODAK Technical Pan Film 2415 is a special-purpose, panchromatic film with extended red sensitivity, extremely fine grain, and extremely high resolving power. You can vary the contrast of the film from moderately high to high contrast by the choice of developer. (You can also obtain normal pictorial contrast by using a special developer. See discussion at the end of this section.) The film's variable contrast feature and excellent definition characteristics make it very useful for copying purposes or for making black-and-white reverse-text slides.

You can use Technical Pan Film to copy black-and-white or color originals and printed matter which may include both illustrations and type, such as books, magazines, and documents. See the discussion about photographing copyrighted material on page 80. This is an excellent film to use for personal microfilming—for record-keeping purposes, for example. When you need black-and-white title slides, you can make them with this film by photographing artwork composed of black type on a white background. Technical Pan Film has a tungsten speed of 320 when you use it as a high-contrast material.

You can also use Technical Pan Film for conventional pictorial photography for making impressive, giant enlargements with a minimum of grain and extreme sharpness. To use the film for this application, though, it must be developed in a special developer to achieve normal contrast and sufficient exposure latitude. Conventional developers produce negative contrast that's too high with this film for normal pictorial photography.

The special developer for pictorial photography has to be mixed from various chemicals—it's not available as a Kodak packaged developer. For information on using the film for pictorial purposes, write to Kodak at the address given on the inside back cover.

OTHER *KODAK* BLACK-AND-WHITE FILMS

There are several black-and-white 35 mm and roll films designed for professional use. Descriptions of the more popular of these films are given here; if you have questions on these films, write to the address given on the inside back cover. For complete information on professional films, see the books *KODAK Professional Black-and-White Films* (F-5) and *Planning and Producing Slide Programs* (S-30), available from photo dealers and bookstores.

KODAK PLUS-X Pan Professional Film is a medium-speed panchromatic film with extremely fine grain and very high sharpness. It has a speed of ISO (ASA) 125. The emulsion side of the film has a retouching surface. This film, which is available in 120 and 220 sizes and in sheet-film sizes, is the roll-film counterpart of 135-size KODAK PLUS-X Pan Film. Its characteristics are much the same as those of KODAK VERICHROME Pan Film.

KODAK TRI-X Pan Professional Film is a high-speed panchromatic film with fine grain and very high sharpness. It is the roll-film version of KODAK TRI-X Pan Professional Film 4164 (ESTAR Thick Base) in sheets, and it has a speed of ISO (ASA) 320. This film is for use with all types of lighting, both outdoors and indoors. It has been designed to produce both excellent shadow detail and

brilliant highlights, especially in photographs taken under artificial light, such as portraits made in studios. Both sides of the film have surfaces designed for retouching. The roll film is available in 120 and 220 sizes.

KODAK Direct Positive Panchromatic Film 5246 is a medium-speed reversal film with extremely fine grain. It is designed for making black-and-white positive slides of high quality directly from the camera exposure. Its reversal processing is faster and simpler than using a negative film and then making separate positives. You can make 2 x 2-inch slides with this film by photographing other slides, photographs, and outdoor and indoor subjects. It has a speed of 80 for daylight and 64 for tungsten. Direct Positive Panchromatic Film is sold only in 35 mm 100-foot-long rolls and must be loaded into 135 magazines for use in 35 mm still cameras. KODAK SNAP-CAP 135 Magazines are available from photo dealers for this purpose.

EASTMAN Fine Grain Release Positive Film 5302 is a low-speed blue-sensitive film with extremely fine grain and high sharpness for printing black-and-white slides—positives—from continuous-tone or line negatives. This film is not recommended for general use in your camera. It's available in 35 mm 100-foot-long rolls.

COLOR SENSITIVITY

The color sensitivity of a film describes its response to light of various wavelengths or colors. While the average normal eye is sensitive to all colors, the same is not necessarily true of films. Silver bromide, the fundamental light-sensitive element in all emulsions, is sensitive only to blue and ultraviolet. Sensitizing dyes incorporated in panchromatic, orthochromatic, and infrared emulsions make these classes of films sensitive to certain other colors or wavelengths of light or other radiation. The type of sensitizing is one of the most important photographic characteristics of a film because it affects both the monochromatic rendition of colors in the photographs you obtain and the handling of the film in the darkroom.

Kodak black-and-white films are divided into several sensitizing classes. Except for certain special sensitizings, there are four general classes. Professional films are available in all four classes; films for general use are available in only two of them—panchromatic and infrared. The color sensitivity of each black-and-white film is given on the Data Sheets in this book. The four sensitizing classes are as follows:

Noncolor-sensitized or blue-sensitive films are sensitive only to ultraviolet and blue-violet; this characteristic is inherent in silver halides—the light-sensitive element in the emulsion.

Orthochromatic films are sensitive to green light in addition to ultraviolet and blue-violet.

Panchromatic films are sensitive to all visible colors, including red, as well as to invisible ultraviolet radiation. Some panchromatic films have extended red sensitivity.

Infrared films are sensitive to ultraviolet, and all visible colors, including deep red, as well as to the invisible infrared radiation.

COLOR SENSITIVITY OF A BLACK-AND-WHITE FILM DETERMINES THE FOLLOWING

Gray-Tone Rendition of Colored Objects. A film that's not sensitized to green or red light will reproduce these colors as tones of gray that are too dark in the print. Panchromatic films for general use will record colors as gray tones in the print in approximately the same relative brightness as they appear

NORMAN W. SCHUMM, KINSA

With a panchromatic film, you can darken the gray-tone rendering of a color in a photograph by using a filter with a color complementary to the color you want to darken. You can use a No. 15 deep-yellow filter to darken the blue sky in the picture and to make the sky and the clouds appear more natural. VERICHROME Pan Film.

to the eye. For critical work you can obtain gray-tone rendition in a photograph that's very close to the visual brightness of the original scene by using the proper correction filter. See the filter recommendations in the Data Sheets.

A few panchromatic films that have extended, or increased, red sensitivity will reproduce red objects as tones of gray that appear lighter in the print than the brightness of the objects themselves appears to the eye.

Filters and Filter Factors. The filters that you can use depend on the color sensitivity of your film. For example, a red filter should be used only with a film sensitive to red light, such as panchromatic film. Since filters absorb light, their use requires an exposure increase. This increase in exposure is specified by the filter factor, which depends on the color sensitivity of the film and the color quality of the light source. For example, a film with a large portion of its sensitivity in the blue-violet requires a much greater relative exposure through a yellow filter, which eliminates most of the blue light, than a panchromatic film requires. Panchromatic film is sensitive to all colors and therefore can record the red and green light transmitted by the yellow filter.

How to apply the filter factor for proper exposure is explained beginning on page 101.

If you want to make an object appear darker in the print than it appears to the eye, use a filter that has a color complementary to the color of the object. For example, a yellow filter darkens a blue sky. To lighten the gray-tone rendering of an object, use a filter similar in color to the object. You can also use filters to increase the contrast between colored objects that would normally photograph as nearly the same shade of gray.

Filter Designations. Filter designations, such as K2, A, and G, that were used to identify different filters in the past have been replaced with the present numbering system. Since published literature sometimes makes reference to the older designations, both designations are given here.

Current Designations	Discontinued Designations	Color
No. 6	K1	Light Yellow
No. 8	K2	Yellow
No. 11	X1	Yellowish Green
No. 13	X2	Dark Yellowish Green
No. 15	G	Deep Yellow
No. 25	A	Red
No. 29	F	Deep Red
No. 47	C5	Blue
No. 58	B	Green
No. 61	N	Deep Green

Recommended filters and factors for each film are given in the Data Sheets in this book. There is more information on filters in the KODAK Photo Books *Using Filters* (KW-13) and *Filters and Lens Attachments for Black-and-White and Color Pictures* (AB-1), available from photo dealers and bookstores.

Safelight Filters. The function of a safelight filter is to provide maximum visibility in the darkroom without fogging the film. For some films, this is achieved by selecting a filter which transmits light in the region to which the film is least sensitive. For example, a noncolor-sensitized film is sensitive only to blue-violet and blue light. You can safely handle this kind of film under a safelight filter transmitting only red light, such as the KODAK Safelight Filter No. 1A (light red).

Since panchromatic films are sensitive to all colors of visible light, you must normally handle them in total darkness. With some restrictions, you can use a dark-green safelight filter. A filter of this color, because it transmits light to which the eye is most sensitive, provides maximum visibility with a minimum amount of light.

Safelight recommendations for each Kodak black-and-white film are given in the Data Sheets in this book.

DEFINITION

The terms definition and sharpness are often used interchangeably, but such usage is only partly correct. Definition refers to the overall appearance of detail, while sharpness is one factor affecting definition and describes the appearance of edge sharpness between details in a photograph.

Definition is the composite effect of several factors, among which are sharpness, resolving power, and graininess. Usually resolving power and sharpness increase as graininess decreases, but this is only a general rule, and there are exceptions.

The terms used to describe sharpness, resolving power, and graininess, which are given on the Data Sheets for each film, should not be used to compare one class of films, such as black-and-white negative films, with another class of films, such as color-negative or color-slide films.

These terms are determined by instrument measurements and by looking at pictures. Instrument measurements and pictures are affected by factors such as diffusion, spectral sensitivity, halation, and contrast. These effects are less of a factor among films in a class so comparison of definition terms within a class of films is valid. They can be large between films in different classes so that comparison of definition terms between different classes of films is not meaningful nor recommended.

Graininess. This refers to the sandlike or granular appearance in a film or slide resulting from the clumping of the silver grains, or dye particles in color film. Graininess is caused by the irregular distribution of the silver grains rather than by the individual grains themselves. Individual grains are not visible under the magnifications used for ordinary enlargements.

For films of a general type, graininess tends to increase with film speed. When a given black-and-white film is developed in different developers to the same contrast index (see page 85), graininess will vary somewhat, depending on the type of developer used. Some fine-grain developers produce less graininess, but at the expense of some loss of film speed. Several Kodak developers are recommended in the Data Sheets in this book. To help you select a developer for black-and-white film, descriptions are provided on the last page of the Data Sheet section.

When enlargements are made from a grainy negative, objectionable graininess usually becomes the most important definition factor limiting the degree of enlargement.

MARYE HORSMAN, KINSA

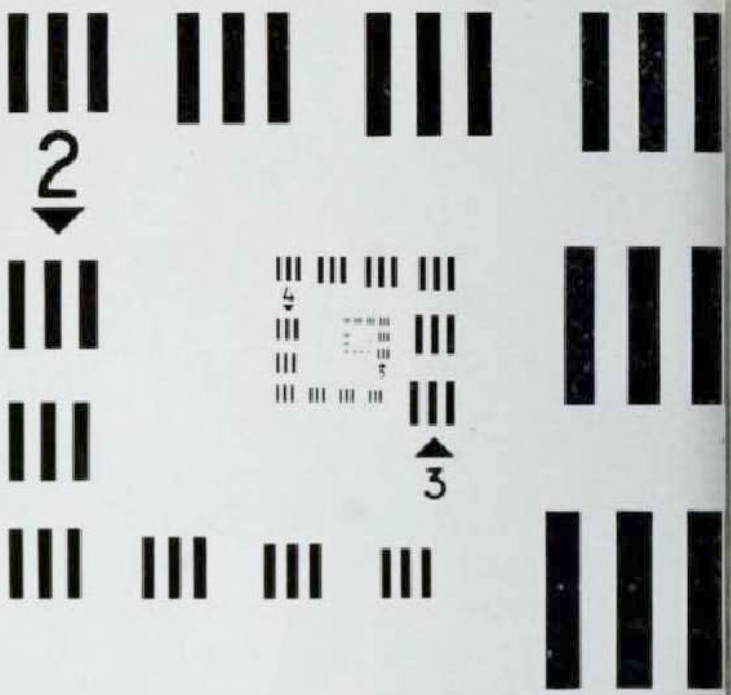
Graininess is increased by overexposure or overdevelopment of black-and-white negatives and by underexposure or overdevelopment of color negatives. Overdevelopment results when the temperature of the developer is too high, the development time is extended, or the film receives excessive agitation during development.

The graininess in a print is most apparent in the lighter middle tones, especially in large, uniform areas such as the sky. You can conceal graininess somewhat by softening the focus of your enlarger or by printing on a paper with a rough surface, but with some sacrifice in sharpness. The type of enlarger you use affects the graininess of the print and slightly affects the sharpness. An enlarger with a diffuse light source produces images that appear very slightly softer in sharpness and minimizes graininess. A condenser enlarger, which has a more specular light

source, produces images that appear very slightly sharper but makes graininess more apparent.

The graininess of both negatives and prints increases with increasing contrast. Use the recommended development for your film, and in black-and-white printing, use the contrast grade of paper suitable for the contrast of the negative. Printing paper that's too low in contrast reduces apparent sharpness while paper too high in contrast increases the appearance of graininess.

Kodak films in the Data Sheets have been assigned graininess classifications, such as *Micro Fine, Extremely Fine, Very Fine, Fine, Medium, Moderately Coarse, Coarse,* or *Very Coarse.*



Photograph of a standard resolving-power test object

Resolving Power. The ability of a film or print to record fine detail is referred to as resolving power. In measuring resolving power a parallel-line test chart is photographed at a great reduction in size (see the illustration). The lines of the test chart are separated by spaces of the same width as the lines. The image is examined under a microscope at a specific magnification, and the number of lines per millimetre that can be seen as separate lines is determined. Lines closer together than this number (more lines per millimetre) are indistinct from each other on the film and appear as a gray mass.

The resolving power of a film depends only slightly on the degree of development, but resolution falls off considerably with both overexposure and underexposure. This is one important reason for exposing negatives correctly. The resolving-power classifications given in the Data Sheets are based upon the maximum values determined for recommended exposure and processing.

The maximum resolution which you can obtain in your negatives is limited by the camera lens as well as by the film, and is lower than the resolution of either one alone. In order to obtain the maximum resolution of which a film is capable, the resolving power of a lens would have to be at least three times the resolving power of the film.

RESOLVING-POWER CLASSIFICATIONS

Resolving Power	Lines per mm
Ultra High	630 or Above
Extremely High	250 to 500
Very High	160 to 200
High	100 to 125
Medium	63 to 80
Low	50 or Below

Sharpness. The sharpness of a film is the visual impression of good edge sharpness between details in a photograph. The boundary between detail that is dark in a photograph and detail that is light is not a perfectly sharp line. The dark area in the negative tends to bleed over into the light area because of light scatter or diffusion in the emulsion. This effect varies with different types of emulsions, the thickness of the emulsion, and the thickness of the film base,

JOHN C. HABERSTROH

This picture shows excellent definition.

as well as the antihalation properties of the base and its backing. Kodak films have thin emulsion coatings and very efficient antihalation properties, and as a result they produce sharper pictures than many of the films in the past.

Sharpness measurements are made by the manufacturer. The procedure is a complex one beyond the scope of this book; but briefly, a sine-wave test pattern of varying frequencies is photographed. The test pattern recorded on the film is scanned by sensitive measuring equipment. Then the data is plotted graphically and is analyzed to determine the sharpness classification. Kodak films in the Data Sheets have been placed in one of the following sharpness classifications: *Extremely High, Very High, High, Medium, Moderately Low,* or *Low.*

The sharpness of some films can be enhanced when you develop them in certain developers that have been diluted. Some diluted developers produce edge effects that make boundaries between objects appear sharper. Development recommendations for those films that will produce improved sharpness with diluted developers are given in the Data Sheets.

Degree of Enlargement. Graininess, resolving power, and sharpness have a combined influence on definition. However, under certain conditions, any one of these may be more important than the others in controlling the definition of a photograph.

When a negative made on a coarse-grain film is enlarged, graininess usually increases to an objectionable level before the loss of resolution or sharpness becomes unacceptable. In this situation, then, graininess is the limiting factor in definition.

While the resolving power and the sharpness of the film are related, resolving power alone is not a definite indication of ability to produce sharp pictures. In some cases it may be misleading. When viewing a picture at normal reading distance and under the best

In addition to sharp camera focus, one of the most important factors in obtaining high definition is to hold your camera steady while you press the shutter release. PLUS-X Pan Film, 1/60 sec *f*/4

LUCIEN PAQUETTE, KINSA

GAYLORD MORRISON, KINSA

For high definition in action pictures, you have to use high shutter speeds to freeze the action. This is especially important when you use a telephoto lens which magnifies both the image and the blur from subject motion. PLUS-X Pan Film, 1/1000 sec *f*/5.6

conditions, the normal eye can resolve about 10 lines per millimetre. If the resolving power of the film is too low to reproduce details about twice as fine as this in the print, definition will be limited by the resolving power. However, when resolving power is adequate and graininess is not noticeable, the sharpness of the image is the most important factor affecting definition. All these factors were taken into consideration in assigning the "Degree of Enlargement Potential" for each negative film in the Data Sheets.

TIPS FOR GOOD DEFINITION

When a photographer takes pictures, processes the film, and makes prints, the definition may be limited not by the film characteristics but by the way the photographer handles the equipment and materials. In order to realize the maximum definition the film is capable of producing, observe the following tips:

Picture-Taking Tips

1. Use a high-quality camera lens and make sure it's clean and free of dust and fingerprints.
2. Focus carefully, preferably with an accurate rangefinder or ground glass. If your camera doesn't have either of these, estimate the distance as accurately as you can. For close-up pictures, use a tape measure if your camera does not have ground-glass focusing.
3. When you want sharp images of both near and distant objects in the same picture, consult the depth-of-field scale on your camera lens or a depth-of-field table in your camera manual for the best focus setting and lens opening to use. Most lenses produce the best definition at a lens opening about midway on the lens-opening scale.
4. Hold your camera steady and squeeze the shutter release slowly. When you can, use a shutter speed of 1/125 second or higher to minimize the effects of camera movement. Telephoto lenses require higher shutter speeds than normal or wide-angle lenses for handholding the camera. For maximum steadiness, place your camera on a tripod or other firm support and use a cable release to trip the shutter. For shutter speeds slower than 1/30 second, a tripod or other support is a necessity for sharp pictures.
5. Expose correctly; avoid overexposure and overdevelopment, either of which will produce negatives that are too dense, or dark. Excessive density causes a loss of definition and increased graininess. Use the minimum amount of exposure that will produce an excellent print with good shadow detail. Develop your film using the recommended developer, time, temperature, and agitation.

Printmaking Tips

1. Use a high-quality enlarger lens and check it for cleanliness. The bottom lens surface is especially prone to fingerprints and the top lens surface to dust.
2. If definition is of utmost importance, use a smooth-surface printing paper, such as glossy or smooth lustre.
3. Choose the grade of black-and-white printing paper that will give you a good print from your negative without either excessive or insufficient contrast.
4. When you make enlargements, be sure that your enlarger is free of vibration and the image is sharply focused on your printing paper.
5. Use the recommended safelight filter and bulb at the proper distance.

RECIPROCITY CHARACTERISTICS

Reciprocity effects are less serious with Kodak black-and-white films for general use than for Kodak color films. You don't have to be concerned with shifts in color balance with black-and-white film. However, film speed and contrast of black-and-white films change when you use long or very short exposure times rather than the typical brief exposure times used in general picture-taking.

Reciprocity characteristics for black-and-white films are given in the Data Sheets. Reciprocity characteristics for color films are described on page 51.

You can correct exposure and development time for the reciprocity effect with black-and-white films according to the tables in the Data Sheets. It's often impractical, though, to correct the development time for a roll of film unless the whole roll was exposed at similar exposure times. Usually varied exposure times are used for taking different pictures on the roll. For this situation, develop the film normally and correct the contrast for the reciprocity effect when you make the prints.

FLASH PICTURES WITH BLACK-AND-WHITE FILM

You can use electronic flash, blue flashbulbs, or clear flashbulbs for flash pictures with black-and-white film. Guide numbers for electronic flash and blue flashbulbs are given on the Data Sheets in this book. If you use flashbulbs it's more convenient to use blue ones since they're recommended for both black-and-white and color film. Then you don't have to buy two different kinds of flashbulbs if you switch from black-and-white to color. However, if you prefer to use clear flashbulbs, simply multiply the guide numbers for blue flashbulbs by 1.25 to obtain the proper guide numbers.

ROBERT MEYERS, KINSA

Electronic flash effectively stopped the action in this picture made on PLUS-X Pan Film.

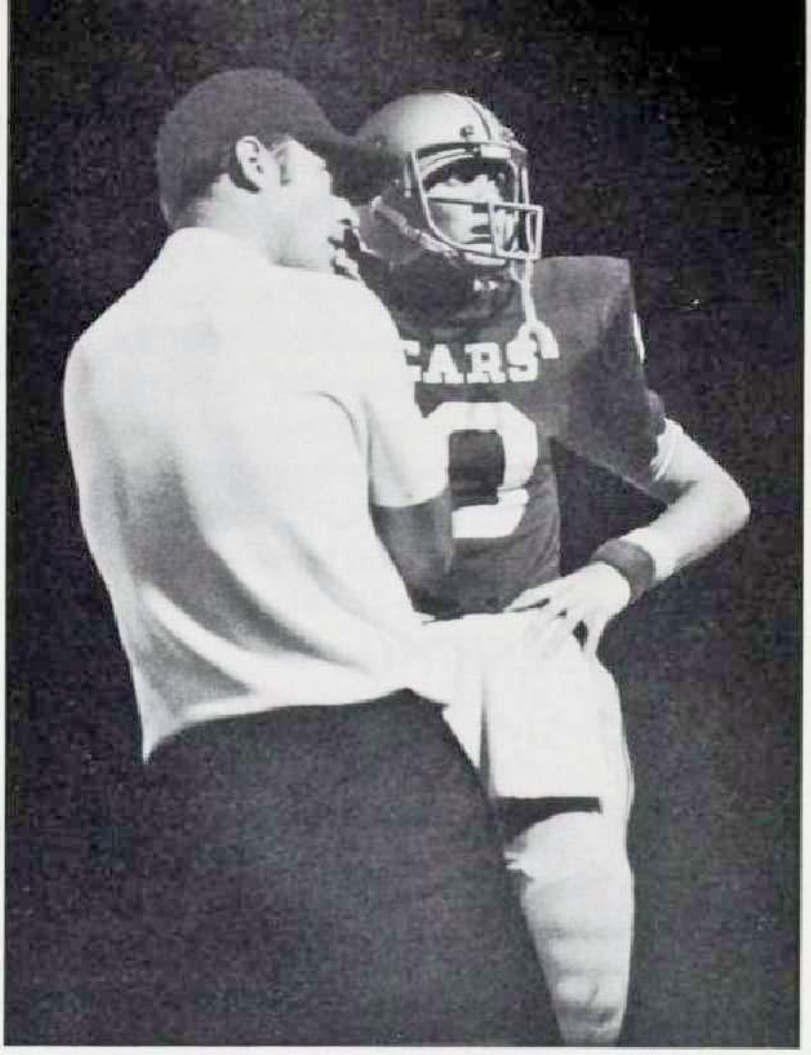
FILMS FOR EXISTING-LIGHT PHOTOGRAPHY

The primary requirements in choosing a black-and-white film for photographing existing-light subjects are high speed and good quality. KODAK TRI-X Pan Film has these features; it's an ideal film for existing-light photography. If you're photographing subjects in relatively bright existing light, such as existing daylight indoors, or if you don't mind putting your camera on a tripod for subjects in very dim light, you can use a film with a slower speed, such as KODAK VERICHROME Pan Film or PLUS-X Pan Film.

If the lighting is extremely poor, or if you want to photograph action in existing light or use telephoto lenses, you

1/60 sec *f*/5.6

MARIE L. LARKIN, KINSA



1/125 sec *f*/1.4

SKIP EROTAS, SKPA

Since the light levels are often low in existing-light photography, you have much more versatility with a high-speed film. KODAK TRI-X Pan Film.

may need a film even faster than TRI-X Pan Film. For 120-size cameras you can use KODAK ROYAL-X Pan Film; for 35 mm cameras, you can use KODAK Recording Film 2475. Since Recording Film 2475 is so fast and 35 mm negatives are small, prints made from this film have coarse grain. But if you need the extremely high film speed, you may find the results acceptable. ROYAL-X Pan Film has medium grain and produces good quality prints.

FILMS FOR COPYING

For photographing continuous-tone originals—for example, photographs, paintings, or pictures in magazines or books—use one of the films recommended for general picture-taking, such as VERICHROME Pan or PLUS-X Pan Film. The speed of these films is ample for originals lighted by photolamps. If the lighting is dim, such as the existing lighting in an art gallery (ask permission to take pictures first), a better choice would be high-speed TRI-X Pan Film. However, when you can put your camera on a tripod or other firm support, a high-speed film is unnecessary.

If you want to copy printed matter, such as the text portion of documents, magazines, or newspapers, you'll get better results with a high-contrast film suitable for this work. Copies of printed matter made on KODAK Technical Pan Film 2415 will have a cleaner, whiter background and will look more like the original than copies made on conventional, general-purpose films.

A note about copyrighted material is in order. Although we do not intend this as specific legal advice, we feel that a note of caution is warranted. By law, the exclusive right to copy a copyrighted work belongs to the copyright owner. Limited copying for "fair use" purposes such as criticism, news reporting, teaching or research is permitted. For other purposes, the copyright owner's permission should be obtained.

PROCESSING

After you have exposed an entire roll of film, you should have it processed promptly for best results. It's easier and more convenient to take your film to your photo dealer for developing and printing. Tell the photo dealer the kind of black-and-white film you want to have processed in case it's special-purpose film that should be custom processed. But when you do your own darkroom work, you'll find it's a lot of fun—and a rewarding and interesting extension of your photo hobby as well. You have much more control over the results when you process the film yourself and make your own prints.

To process the film, we recommend that you use a film tank. Several different kinds are available from your photo dealer. Be sure that the one you select will accept the size of your film.

Loading your film into the developing tank requires TOTAL DARKNESS.

To open **135 magazines,** hold the magazine with the long end of the spool down, and use a lid lifter or a hook-type bottle opener to remove the upper end cap from the magazine. Pull the loaded spool out of the magazine, taking care not to let the film unwind. The film is attached to the magazine spool with a strip of tape. Separate the film from the spool. Load the film-tank reel according to the film-tank instructions.

To break open an exposed **110 or 126 cartridge,** hold it with the label facing you and your thumbs on the label. Use both hands to bend the two cylindrical chambers toward the label. If it's a 110 cartridge, pull the film, together with its backing paper, from the take-up chamber in a direction so that the *paper* rubs against the inner surface of the cartridge back. This minimizes the likelihood of scratching the film emulsion. If the end of the backing paper (trailer) has been wound into the take-up chamber, you will have to pry open the chamber (after breaking the cartridge) to retrieve the film.

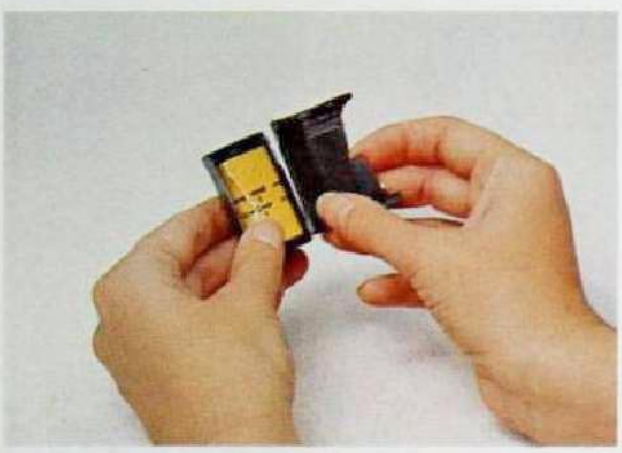
DON BUCK

To process your own 135 film, open the magazine in TOTAL DARKNESS. Hold the magazine with the long end of the spool down, and use a lid lifter or a hook-type bottle opener to remove the upper end cap from the magazine.

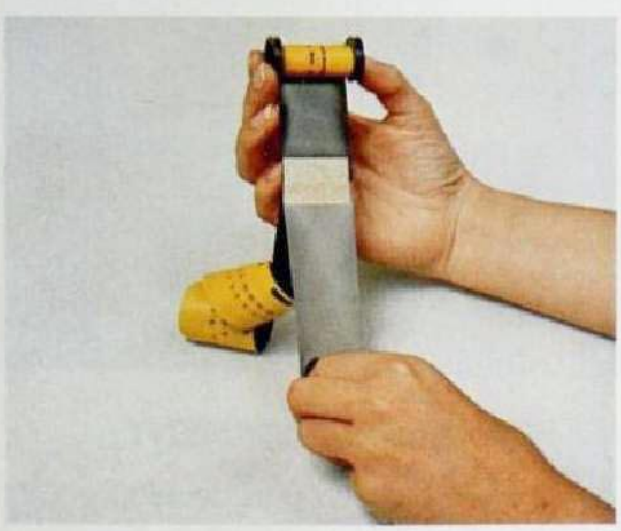
After breaking open a 126 cartridge, remove the film spool from the larger chamber by separating the plastic sections surrounding the spool. Unroll the film and the paper backing. The film is attached to the paper backing in the same way as roll film.

Rip the "Exposed" sticker on **roll film** and carefully unroll and separate the film from the paper backing. Be careful not to cinch or scratch the film. The film is attached to the paper with a strip of tape at the end near the core of the film spool.

To open a 126 or 110 cartridge for processing, break open the cartridge in TOTAL DARKNESS by bending the cylindrical chambers toward the label.



To remove the film after you've opened a 126 cartridge, separate the plastic sections surrounding the spool. If it's a 110 cartridge, pull the paper backing out of the broken cartridge in a direction so that the paper rubs against the cartridge. The film will come out along with the backing paper. Handle the film by the edges only.



DON BUCK

The film in 126 cartridges is attached to the paper backing with a strip of tape. Detach the film and discard the paper and tape. Handle the film by the edges only.

PROCESSING RECOMMENDATIONS

Develop your film for the time given in the development table in the Data Sheet for the film you're using. Be sure to use the recommended agitation procedure. See "Tips on Using Film Developing Tanks."

The developing times given in the Data Sheets for Kodak black-and-white films are for small roll-film tanks. A small tank is defined as one in which the agitation is produced by moving the tank or the reel inside when the reel has a handle. A small tank is for processing roll film of conventional length and size, such as 135, 126, 110, 120, 127, and 620 sizes, with the film held in a reel or apron. The reels are not used in a rack, basket, or on a spindle. The solution volume of a small tank is usually 1 quart (about 1 litre) or less.

Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5 at 65 to 75°F (18 to 24°C) for about 30 seconds with agitation. With most films you can use a water rinse if an acid stop bath is not available. However, an acid stop bath is better because it stops development instantly by neutralizing the developer. See the Data Sheet for your film.

Fix in KODAK Fixer, KODAK Fixing Bath F-5, KODAK Rapid Fixer, or KODAFIX Solution at 65 to 75°F (18 to 24°C). *Agitate films frequently during fixing.* See the Data Sheet for your film for the recommended fixing time.

Wash for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). After washing, to minimize drying marks, treat in diluted KODAK PHOTO-FLO Solution for 30 seconds, or wipe surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.

You can use KODAK Hypo Clearing Agent after fixing to reduce washing time and conserve water. First remove excess fixer, or hypo, by rinsing the film in water for 30 seconds. Then bathe the

film in KODAK Hypo Clearing Agent solution for 1 to 2 minutes, with moderate agitation. Then wash it for 5 minutes in running water, using a water flow sufficient to give at least one complete change of water in 5 minutes.

You'll obtain the best results when you keep the temperatures of the rinse, fix, and wash approximately the same as the developer temperature.

Dry in a dust-free place.

TIPS ON USING FILM DEVELOPING TANKS

In the dark (see safelight recommendations on the Data Sheets), start the timer and place the loaded film reel or apron into your tank containing the developer. Keep the reel or apron under the surface of the solution, and tap it on the bottom of the tank before you replace the tank cover. This helps dislodge air bells. After you replace the cover, you can carry out the remaining steps in normal room light.

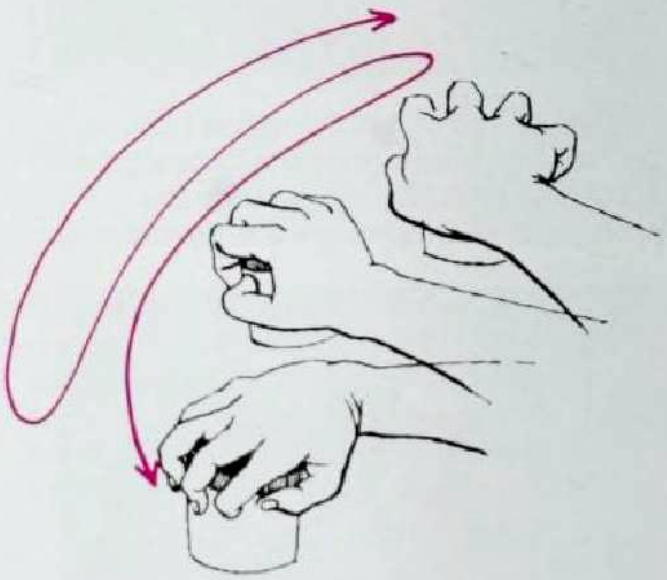
If this procedure is not possible with your tank, begin the process by pouring in the developer with the reel of film inside the tank. Tap the bottom of the tank against the working surface to dislodge air bells.

Recommended Agitation

Proper agitation is as important as the correct temperature and development time. Too little agitation during development will cause mottle and uneven development. Too much agitation can cause overdevelopment and streaks on the film. When you follow the recommended agitation procedures, you'll avoid these undesirable effects.

Methods of Agitation. After the film has been immersed for 30 seconds, agitate the tank for 5 seconds according to the method recommended in the next column for your tank. Repeat this agitation at intervals of 30 seconds for the remainder of the development time.

1. For a tank that can't be inverted, agitate by sliding the tank back and forth over a distance of about 10 inches at a rate of two cycles per second during the agitation intervals. At the same time, turn or rotate the tank back and forth through about one-half turn (see below).



The recommended method of agitation for a film tank that can't be inverted.

2. For tanks that you can turn upside down without spilling the solution, invert the tank once per second during the 5-second agitation intervals.
3. With tanks that have a handle for turning the reel, rotate the reel back and forth gently through about one-half turn at a rate of one cycle per second during the agitation intervals.

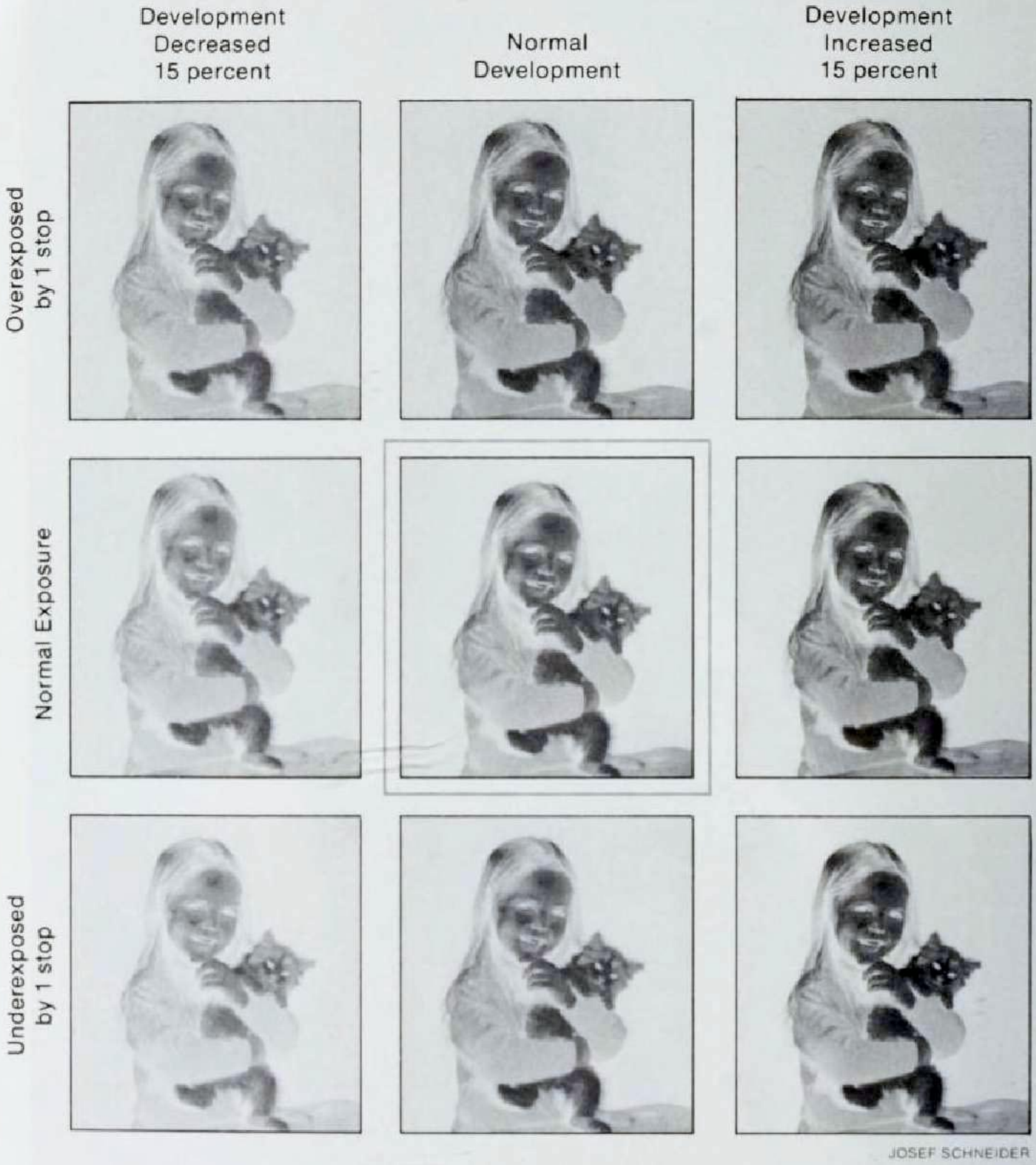
If the method of agitation described in the instructions for your film tank differs from these, agitate the film for 5 seconds at 30-second intervals according to the method recommended in the tank instructions.

DEGREE OF DEVELOPMENT

The degree to which you develop your film has an important effect on the quality of your finished pictures. Development determines to a large extent the contrast grade of photographic paper you'll need to make the best possible

LARRY ECKLUND

In this picture, detail has been retained in both highlights and shadows for good tone rendition—the result of normal exposure and normal development of the film.



These negatives show the results of changing the camera exposure and the degree of development. The negative in the center received normal exposure and normal development.

These illustrations were made from negative print images for technical reasons. However, each negative print was matched as closely as possible to actual negatives exposed and processed as indicated.

prints from your negatives. The degree of development for a film and developer combination depends on the developing time, the temperature of the developer, and the degree of agitation. Underdevelopment reduces the contrast of the negative and can cause loss of shadow detail. Overdevelopment increases negative contrast and graininess, reduces sharpness, and can block up highlights, making the negatives hard to print. Negatives that have received correct exposure and development should print best on contrast grade No. 2 or No. 3 photographic paper. The development recommendations given in the Data Sheets will produce the proper contrast in prints made with average printing conditions from properly exposed negatives of average subjects.

Since the degree of development depends on time and temperature, several normal development times are given to compensate for changes in temperature. See the development tables in the Data Sheets.

Contrast Index

The degree of development, or development contrast, is specified by contrast-index measurements. Most of the recommended development times given in the Data Sheets are based on a normal contrast index of 0.56. Under average conditions, properly exposed negatives processed to this contrast index should print on medium-contrast photographic paper. If your negatives are consistently too contrasty and require low-contrast paper such as grade No. 1, develop to a lower contrast by reducing development time by about 30 percent. If your negatives are consistently too low in contrast and print on high-contrast paper, such as grade No. 4, develop to a higher contrast by increasing the development time by about 40 percent.

To produce negatives consistent in overall density and quality, you should make an exposure compensation when you adjust development times, particularly with shorter development times. When reducing development times, increase exposure by about ⅓ stop. When increasing development times, reduce exposure by about ⅓ stop.

The effective printing contrast of your negatives is affected by the method you use in making prints. A diffusion-type enlarger produces about the same degree of contrast in the print as a contact printer. A condenser enlarger produces greater contrast than a diffusion enlarger or a contact printer. The difference in contrast may be as much as the contrast difference between No. 2 and No. 3 grades of photographic paper. Complete information on printing papers is given in the book *Quality Enlarging with KODAK B/W Papers* (G-1). If you want to know more about enlarging techniques, a good book on this subject is *Black-and-White Darkroom Techniques* (KW-15). Both of these Kodak books are sold by photo dealers and bookstores.

Push Processing

Push processing black-and-white film lets you expose the film at a higher film speed number for situations where you need more film speed. As explained earlier, a higher speed film permits you to take pictures in dim existing light while handholding your camera, use high shutter speeds to stop action, use telephoto lenses for larger images, or use small lens openings to gain depth of field, all under poor lighting conditions.

With push processing you can expose your film at twice the film speed. For example, if you're using KODAK TRI-X Pan Film which has a speed of ISO (ASA) 400, you can expose it at 800 if you push process the film. This recommendation is for normal-contrast scenes. For low-contrast scenes, for example, scenes with little or no shadow detail to record, you can usually expose the film

TRI-X Pan Film—ISO (ASA) 400, 1/30 sec *f*/4, normal processing

BOB CLEMENS

TRI-X Pan Film—Film Speed Number 800, 1/30 sec *f*/5.6, push-processed 1 stop with a 50 percent increase in development time

at 4 times the normal speed with push processing. That's a film speed number of 1600 with TRI-X Pan Film.

To push process your film, increase the recommended development time by 50 percent. You can use the developers recommended on the film instructions or on the Data Sheets in this book. Push processing is not recommended, however, with KODAK MICRODOL-X Developer.

It's important to realize that push processing black-and-white film does not actually increase the speed of the film by a significant amount. The speed of a negative film is an inherent characteristic determined during manufacture. Increasing the development time will not produce detail on the film where nothing was recorded in the camera—from underexposure, for example. Push processing does increase the density, or blackness, of exposed areas on the film to make negatives of normal- or low-contrast scenes more printable. Prints from push-processed, underexposed negatives will usually look better than with normal processing. While push processing film does increase the quality of prints made from underexposed negatives, it does not compensate fully for underexposure. Push processing will not produce the same level of quality as normally exposed and processed negatives. The most serious change in prints made from push-processed negatives is a loss of shadow detail.

In addition, push processing increases negative contrast and overall graininess. The negatives will require a lower contrast photographic paper for making the prints and grain will be more apparent in enlargements. Prints from negatives of normal- and low-contrast scenes should be quite acceptable if you're willing to accept a slight loss of shadow detail and an increase in contrast. It's usually not practical to push process film images of high-contrast scenes because the negatives will be difficult to print and the prints will be too contrasty.

Push processing black-and-white film is beneficial when it helps you get good pictures that otherwise would be impractical or impossible because of adverse exposure conditions. But you should keep in mind that you'll obtain the highest photographic quality in pictures of normal scenes when you expose your film at its ISO (ASA) speed and process it normally.

Note: If the recommendations for extended development on some film instructions differ from those given above, follow the film instructions.

ESTHER HENDERSON

Exposure

To determine correct exposure, you need to know the speed of the film you're using. The film speeds in this book are for exposure meters or cameras with built-in meters marked for ISO or ASA speeds or Exposure Indexes.

The speeds for most of the films in this book are determined according to International Standards and American National Standards and are designated ISO (ASA) speeds. In addition to ASA speed numbers, ISO speed numbers are being given in anticipation of future worldwide use. ISO speed numbers are numerically the same as ASA speed numbers. For example, if the speed of a film is ISO (ASA) 64, you would set 64 on the ASA dial of your camera or exposure meter. Some special-purpose films are not covered by these standards and are assigned film speeds without the ISO (ASA) designation. You can use these recommended film speeds on your exposure meter in the same way as ISO (ASA) speeds.

Film speed indicates relative sensitivity to light. Film with a high speed number is more light-sensitive, or faster, than a film with a low number. For example, a film with a speed of ISO (ASA) 200 is twice as fast as a film with a speed of ISO (ASA) 100. The film speed for each Kodak film is given in the Data Sheets and on the outside of the film carton, in the instructions printed inside the film carton, or in the instruction sheet packaged with the film, depending on the kind of film.

If your exposure meter or camera with a built-in meter is marked with a

different scale of film-speed numbers, you can convert ISO (ASA) speeds to the film-speed numbers used on your meter. For example, some exposure meters and cameras manufactured outside the United States use the DIN system. DIN speed is printed on most Kodak film cartons. See the table on page 109 for converting ISO (ASA) speeds to ISO (DIN) speeds. You can also obtain the KODAK Customer Service Pamphlet *Equivalent Exposure Meter Settings* (AF-18), which gives equivalent ASA, BSI, early Weston, DIN, and Scheiner film-speed numbers. See your photo dealer for a copy, or write to Kodak at the address given on page 52.

Many of the simpler cameras, such as some of those that take either 110-size or 126-size film, are not designed for use with high-speed film and will not expose it properly. For example, many older 110-size cameras are not designed for use with KODACOLOR 400 Film, and many 126-size cameras are not designed for use with KODAK EKTACHROME 200 Film (Daylight). Read the camera instruction manual or write to the manufacturer or the American distributor of your camera to see if you can use such films.

EXPOSURE LATITUDE

The exposure latitude of a film is the range of camera exposures from underexposure to overexposure which will produce pictures of acceptable quality with that particular film. In other words, exposure latitude is the amount you can be off from the ideal exposure and still get acceptable pictures. Exposure latitude depends mainly on the film you're using, the subject brightness range, and your own requirements for picture quality.

Continuous-tone negative films have greater exposure latitude than slide, or reversal, films. However, you obtain the best quality with any film when your pictures are properly exposed.

Film speeds and exposure guides for Kodak negative films are based on the minimum exposure required to record important shadow detail. Because of the latitude of negative films, slight variations in exposure produce no loss of image quality. Generally, negative films have greater latitude for overexposure than they do for underexposure.

Film speeds and recommended exposures for Kodak color-slide films and black-and-white slide films are based upon the exposure that produces the best picture when highlight detail and shadow detail are of equal importance. Slide, or reversal, films have higher contrast than most negative films. In addition, no corrections can be made after you take pictures because no printing step is used. As a result, camera exposure is more critical with reversal films than with continuous-tone negative films. Since reversal films have limited exposure latitude, carefully follow your exposure-meter readings or exposure guides unless results with your equipment consistently indicate the need for an adjustment in the indicated exposure.

EXPOSURE GUIDES

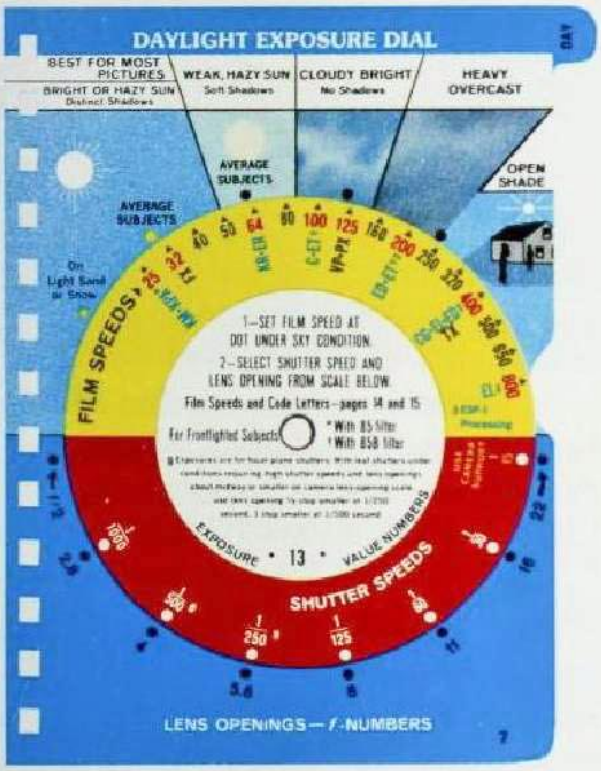
Kodak provides exposure tables and dial exposure guides which are based on many practical picture tests and extensive data on illumination, subject brightness, film speed, and printmaking requirements. The exposure recommendations have been confirmed by years of experience. For any picture-taking situation specifically covered by a Kodak exposure guide, the camera settings indicated by the guide will produce a high percentage of properly exposed photos.

Even if you have an exposure meter, exposure guides are useful for verifying that you're using your meter correctly or for providing a backup in case your meter stops working. In addition,

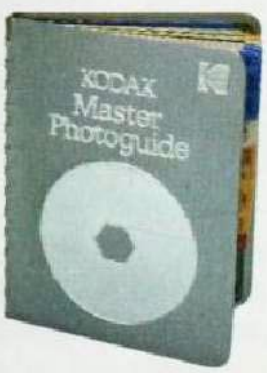
exposure guides are helpful for planning purposes to indicate in advance what camera settings, film speed, and equipment requirements will be necessary for the pictures you want to take.

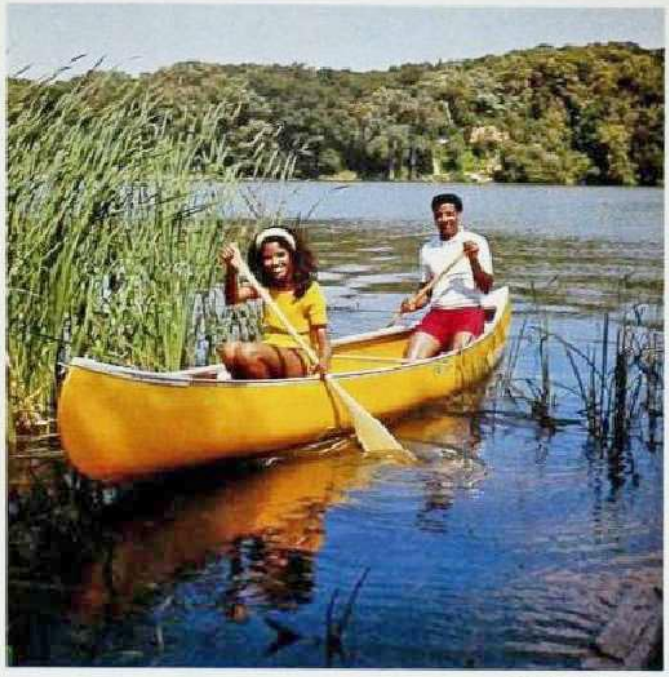
The *KODAK Master Photoguide* (AR-21) contains dial exposure calculators covering the use of daylight, flash, photolamps, and existing light with a variety of Kodak films. The text includes information on lighting techniques, filter selection, depth of field, and other essentials. This guide is sold by photo dealers.

Exposure tables are provided in the Data Sheets in this book, in the instructions included with Kodak films, and in many Kodak publications.



You can obtain a high percentage of properly exposed pictures by following exposure guides. This Daylight Exposure Dial is from the *KODAK Master Photoguide* (AR-21), available from photo dealers.





JOHN HOOD

LEE HOWICK

For average scenes such as these, it's a simple matter to determine the correct camera settings. Just make an overall meter reading from the camera position.

EXPOSURE METERS

The big plus of owning an exposure meter or a camera with a built-in exposure meter is that you can determine exposure for almost any kind of scene and lighting situation. If you use your exposure meter according to the procedures recommended by the meter or camera manufacturer, you should get a very high percentage of properly exposed pictures.

MARTIN TAYLOR

An exposure meter is invaluable when the lighting or atmospheric conditions are unusual. KODACHROME 25 Film (Daylight), 1/125 sec *f*/5.6

However, an exposure meter doesn't think for itself. If you use your meter in a purely mechanical fashion, chances are that you will not get consistent results. Study your exposure-meter or camera instruction book and learn how to use your meter properly; familiarize yourself with the flexibility and limitations of the type of exposure meter you have. Then you can use this knowledge to interpret your meter readings and obtain a larger percentage of correctly exposed pictures.

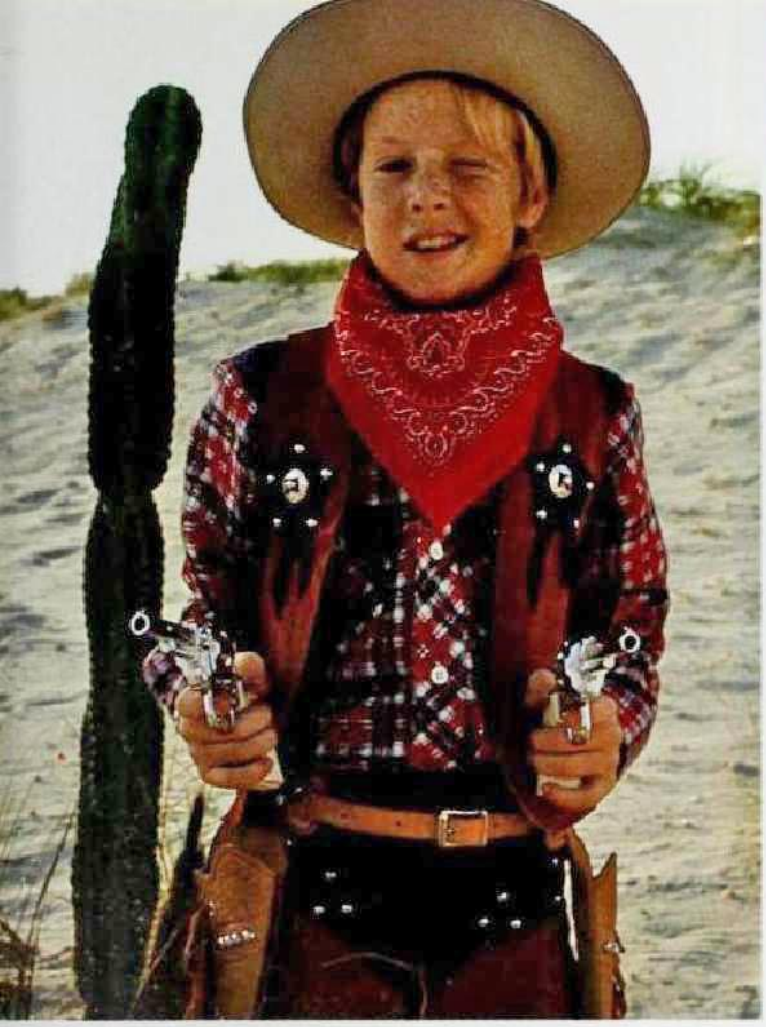
Basically there are two types of exposure meters: reflected-light and incident-light. The exposure meters built into cameras are reflected-light meters. Some meters have attachments that let you measure either reflected light or incident light. A special kind of reflected-light meter is the spot meter. This kind of meter selectively reads the light reflected from one small area in a scene.

With a reflected-light exposure meter, you point the meter or camera with built-in meter toward the subject to determine the correct exposure.

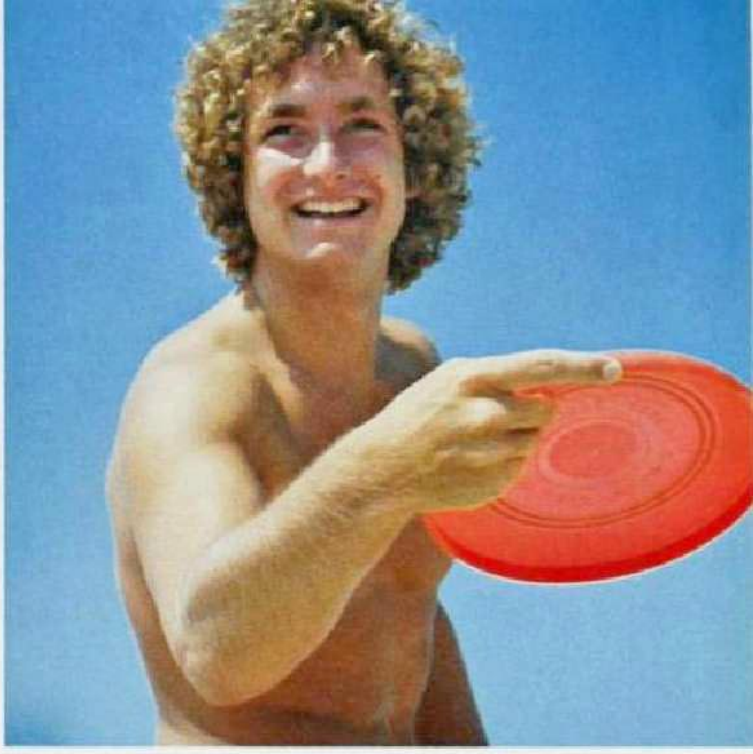
With an incident-light exposure meter, you point the meter toward the camera position to make the reading.

REFLECTED-LIGHT METERS

A reflected-light exposure meter measures the light reflected from all the areas included in the meter field of view. One of the main advantages of a



RONALD DE MILT



PETE CULROSS

When there is a lot of sky in the background, make a close-up reading of your subject with an in-camera exposure meter or a separate handheld reflected-light meter.

reflected-light meter is that you can make the meter reading from the camera position for most scenes. Because the meter is designed to average the overall light reflected from scenes with normal reflectance characteristics, it gives correct exposure for most pictures.

Since the exposure meters built into cameras are reflected-light meters, you can aim and use the meter from the camera position when you are ready to take the picture. The information given here for reflected-light exposure meters also applies to in-camera meters. Some cameras are automatic; that is, you don't have to be concerned with exposure because the built-in exposure meter makes the reading and sets the exposure for you automatically. Built-in exposure meters give very good results for most scenes.

However, for some scenes an overall exposure-meter reading will result in incorrect exposure. When you make an overall meter reading from the camera position, your exposure meter is influenced by a predominant light or dark area if there's one in the scene. Your exposure meter, though, has no way of knowing what part of the scene is the most important part of your picture. If the scene has light and dark areas of about equal distribution and importance, your exposure meter will usually indicate the correct exposure. However, if the most important part of the picture is surrounded by a large area which is much lighter or darker, your meter will indicate an exposure which is incorrect for the important part. The way to determine the correct exposure in such situations is to make a selective meter reading of the principal subject. For example, a close-up reading of the subject will exclude unimportant light or dark surroundings in the scene that can mislead your exposure meter. In making close-up readings, be careful not to measure your shadow or the shadow from the meter or the camera.

NORM KERR

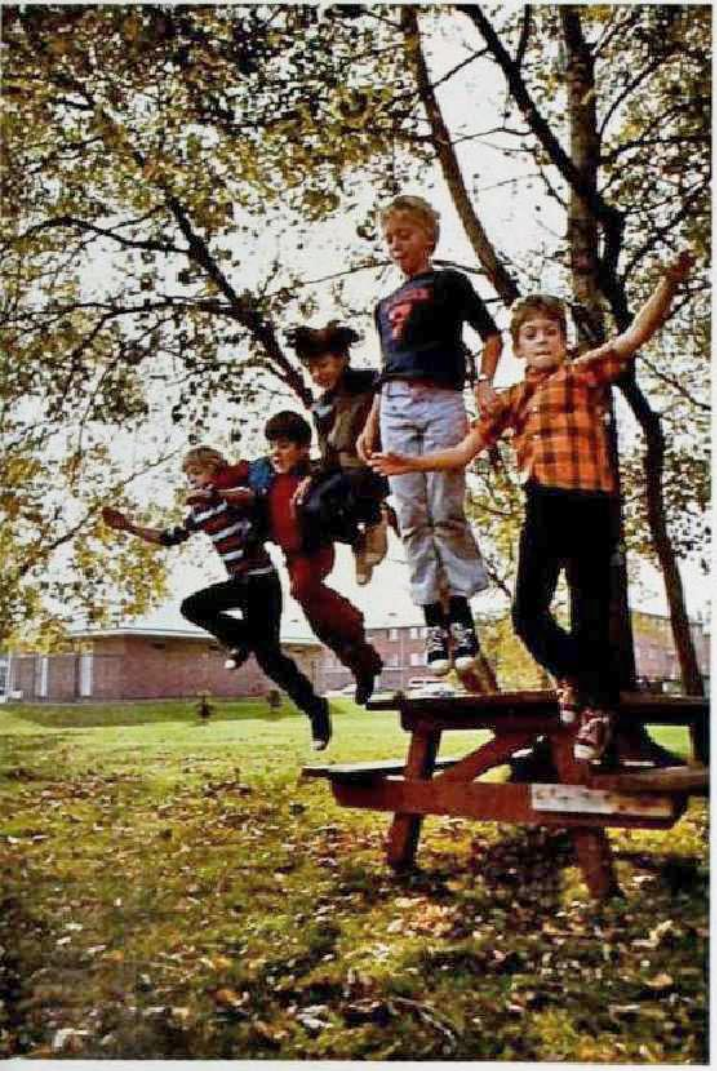
NEIL MONTANUS

A light background, such as bright sand or snow, with average or dark subjects can fool a reflected-light meter. A reading made from the camera position will be too high and the subjects will be underexposed. For correct exposure, make a close-up meter reading of the subjects.

Here are some examples of scenes that require selective meter readings to determine optimum exposure:

The most common situation that can mislead reflected-light meters is a scene that includes a large portion of the sky. The sky is brighter near the horizon than the other parts of the scene with average reflectance. Therefore, the meter may be overly influenced by the sky and will indicate too little exposure, causing underexposure of the subject. This effect is even greater on overcast days when the sky is whitish. Some manufacturers of reflected-light meters recommend that you tilt the meter downward at a slight angle to avoid undue influence from the sky. Most cameras with built-in exposure meters are designed to make the meter reading mainly from the center and bottom of the scene you're photographing to reduce the influence of the sky brightness. It's usually not necessary or practical to tilt cameras with built-in exposure meters downward to avoid the sky. Consult your camera instruction manual for the correct use of your camera exposure meter.

Scenes with large light areas such as snow, light sand, or white concrete may mislead the exposure meter when the most important part of the scene is much darker than the surroundings. This will result in underexposure of the subject. In these situations, take a close-up meter reading of the principal subject for proper exposure. When a large light area is the important part of the picture, such as a snow scene but not a close-up of a person, your reflected-light meter may be overly influenced by the bright snow, and the picture will be underexposed, with



JOHN VAETH

KODACOLOR 400 Film, 1/500 sec *f*/5.6

ROBERT KRETZER

KODACHROME 25 Film (Daylight), 1/30 sec *f*/4

When subjects are in the shade with a sunlit background, a reflected-light meter reading made from the camera position would respond too much to the bright background so that shaded subjects would be underexposed. Move in for a close-up meter reading.

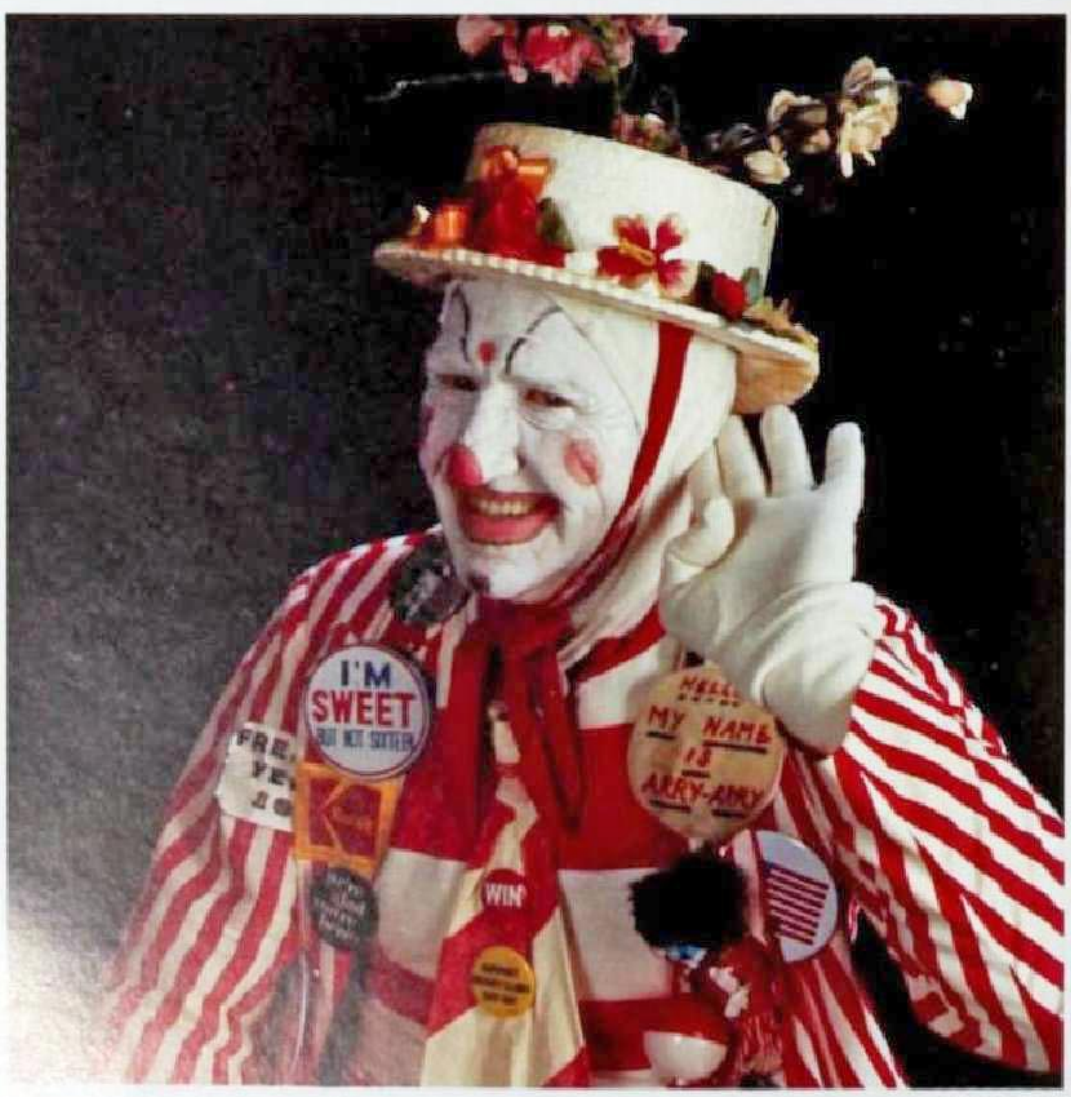
gray-looking snow. In a situation such as this, compare your meter reading with a Kodak exposure guide, such as the one on the film instructions. If your meter reading indicates much less than the recommended exposure for snow scenes in the exposure guide, you'll probably get better results by following the exposure guide. Or you can modify the reflected-light meter reading made from the camera position and use 1 stop more exposure than indicated by the meter. Conversely, when a large dark area is an important part of the picture, use 1 stop less exposure than an overall meter reading indicates.

When the subject is much lighter than the surroundings, your exposure meter may indicate too much exposure, causing overexposure of the subject. An example is an outdoor scene with a bride in a white wedding dress standing in front of a dark foliage background. Because of the dark surroundings, your meter sees mostly the large dark area and therefore indicates an exposure that is too much for the subject. As a result, the subject is overexposed. Once again, take a close-up meter reading of the face of the principal subject to determine the correct exposure.

In backlighted scenes the background is often sunlit and is therefore brighter than the subject. Also, light can shine directly into the light-sensitive meter cell. Both these factors cause a high meter reading and underexposure results. The solution is to take a close-up meter reading while shading the meter with your hand or some other object to block the sun (or lights) that may be directly illuminating the meter cell. Some cameras with built-in exposure meters have a backlight compensation button

DON MAGGIO

A reflected-light meter reading made from the camera position would be too low because of the dark background, and the subject would be overexposed. A close-up meter reading will produce more accurate exposure.



WALTER LEE

BOB CLEMENS

NEIL MONTANUS

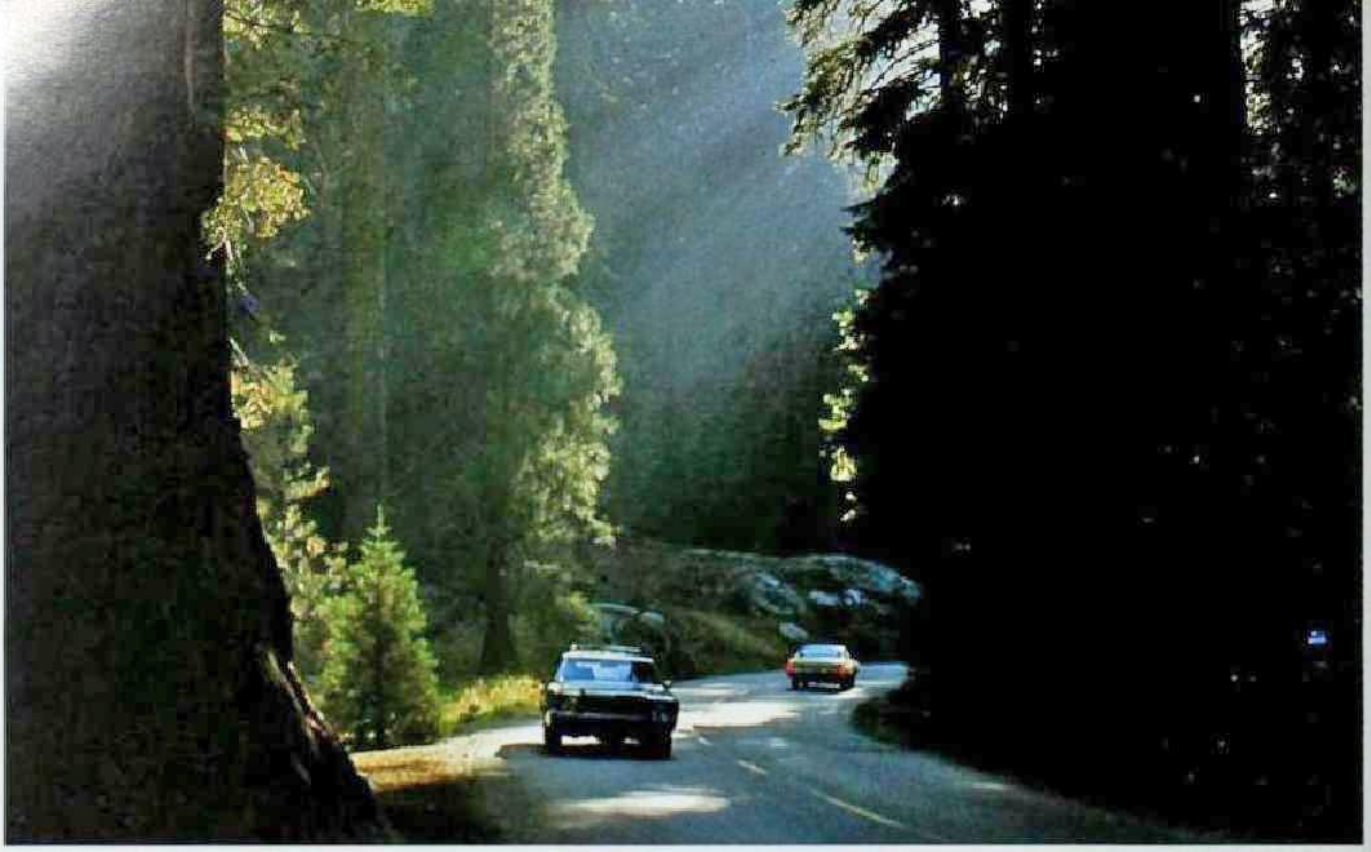
In these backlighted scenes, a reflected-light exposure meter would be influenced by the bright background, and the sun might shine into the light-sensitive cell of the meter. Both of these factors would result in underexposure. Make a close-up meter reading of the subjects.

which increases exposure, usually 1½ to 2 stops, for use with backlighted subjects. See your camera manual.

You can make close-up meter readings with some built-in camera meters and then move back to take the picture. You can usually do this with a manually adjustable camera. Automatic cameras often have a means of letting you hold a close-up meter reading by partially pressing the shutter release or by pressing a memory-lock button while you move back to your original position to take the picture.

An alternative method for obtaining correct exposure for backlighted subjects with a manually adjustable camera is to simply adjust exposure according to exposure guidelines. For close-ups of backlighted subjects illuminated by a large area of open sky, use a lens opening 2 stops larger than for frontlighted subjects; for backlighted subjects at a medium distance, use a lens opening 1 stop larger than normal; and for distant scenic views with no large shadow areas, use the same exposure as for frontlighting.

If you can't make close-up meter readings with your camera, you may be able to change the film-speed setting to a different number to compensate for unusual lighting or subject brightness. For photographing average or dark subjects in *very light* surroundings, divide the speed of your film by 2 and set the resulting *lower* number on the film-speed dial of your camera for 1 stop more exposure. For example, if you were using KODACHROME 64 Film in this



HERB JONES

PETE CULROSS

Since a spot meter measures a small area to determine exposure, it would come in handy for pictures such as these. You could make the meter reading of the important areas of the scenes from the camera position.

type of situation, you would set 32 instead of 64 on the film-speed dial. For photographing average or light subjects in *very dark* surroundings, multiply the speed of your film by 2, and set the resulting *higher* number on your film-speed dial for 1 stop less exposure.

Instead of changing the setting on the film-speed dial to alter exposure for unusual scenes, many automatic cameras have an exposure compensation dial which lets you increase or decrease exposure by a fixed amount, such as ±½, 1, 1½, or 2 stops. Remember to reset your film-speed dial or exposure compensation dial to the normal setting when you've finished photographing the unusual scene.

Since operating procedures vary with different cameras, check your camera instruction manual for the recommended method to use with your built-in

camera meter for making close-up meter readings or for altering the exposure.

Spot meters selectively measure the reflected light of small areas in a scene from the camera position. These meters measure only the small area toward which they are pointed. Therefore, they are not influenced by large light or dark surrounding areas. This type of meter is useful for telephoto pictures, which include only a small portion of the overall scene, and for scenes with uneven lighting or reflectance. However, since a spot meter reads one small area at a time, you must decide which areas in the scene are important to your picture. This is especially true when you're taking pictures with a normal or wide-angle camera lens, which usually includes many different areas of brightness in one picture. The important areas in the scene are the areas that you should measure with the spot meter. To determine correct exposure in this type of situation, take a meter reading of the lightest important area in the scene and the darkest important area in the scene; then set your exposure halfway between the two. For example, if your exposure meter indicates that 1/250 second at *f*/16 is correct for the light area and 1/250 second at *f*/4 is correct for the dark area, then 1/250 second at *f*/8 is the average exposure which is the best compromise for the scene.

Because it is often necessary to make several exposure-meter readings, using a spot meter is more time-consuming and requires more knowledge of what to measure in the scene. Consequently, such meters are used primarily by experienced photographers.

Reflected-Light Readings of a Substitute Test Card

When you are photographing a subject indoors, the subject is frequently brighter than other parts of the scene, such as the background. A person lighted by photolamp illumination requires the same exposure to produce good flesh tones whether the person is in front of a dark background or a light one. But if you make reflected-light meter readings of such scenes from the camera position, the readings will be misleading because the meter will be influenced by a background which is much lighter or darker than the subject you're photographing.

To determine exposure for this type of scene, take a close-up reading with a conventional reflected-light meter, or use a spot meter from the camera position. If you make the meter reading of your subject's face, you must divide the film speed by 2 to compute your exposure. This is necessary because average Caucasian skin has twice as much reflectance as the average indoor scene, and exposure-meter calibration is based upon average scene reflectance.

Another way you can determine exposure accurately for these situations is to make reflected-light readings of a test card of known reflectance. Most indoor scenes have an average reflectance of about 18 percent. If you make a reflected-light reading of an 18-percent gray card held close to and in front of the principal subject, you should obtain accurate exposure for the scene. Photo dealers sell KODAK Gray Cards for this purpose. The gray cards come in a package of two, and they are 8 x 10 inches in size. Each gray card has a gray side of 18 percent reflectance and a white side of approximately 90 percent reflectance. You can use the white side to get a higher meter reading in dim lighting. If you use the white side or any other matte white card of about 90-percent reflectance, divide the ISO (ASA) speed of the film by 5 and set the answer on the calculator dial of your exposure meter, using the nearest film-speed number.

To make a meter reading of a gray or white card, place the card close in front of your subject and hold it straight up

and down, facing halfway between the main light and your camera. Make the meter reading by holding your meter close to the card so that it reads only the card. Be sure that the meter doesn't read its own shadow. When you make the reading, turn on all the lights that will illuminate the subject. Shield your exposure meter from other lights that might shine directly into its light-sensitive cell.

You can also use the KODAK Gray Card for meter readings outdoors. This is particularly helpful when distance or a barrier of some sort makes it difficult to get an accurate reading of the light reflected from the subject or when unimportant light or dark areas can mislead your meter. It's desirable to place the card at or near the principal subject, but when it's impractical to do so, just make sure that the light on the gray card is the same as the light on the subject. When you make a meter reading from the gray card, your meter is not influenced by light or dark areas in the scene. Since exposure meters are calibrated for average reflectance, the meter reacts as though the subject has average reflectance.

When you use the card outdoors, exposure adjustments are necessary when the reflectance of the card differs from that of the scene. Complete instructions are included with the gray cards.

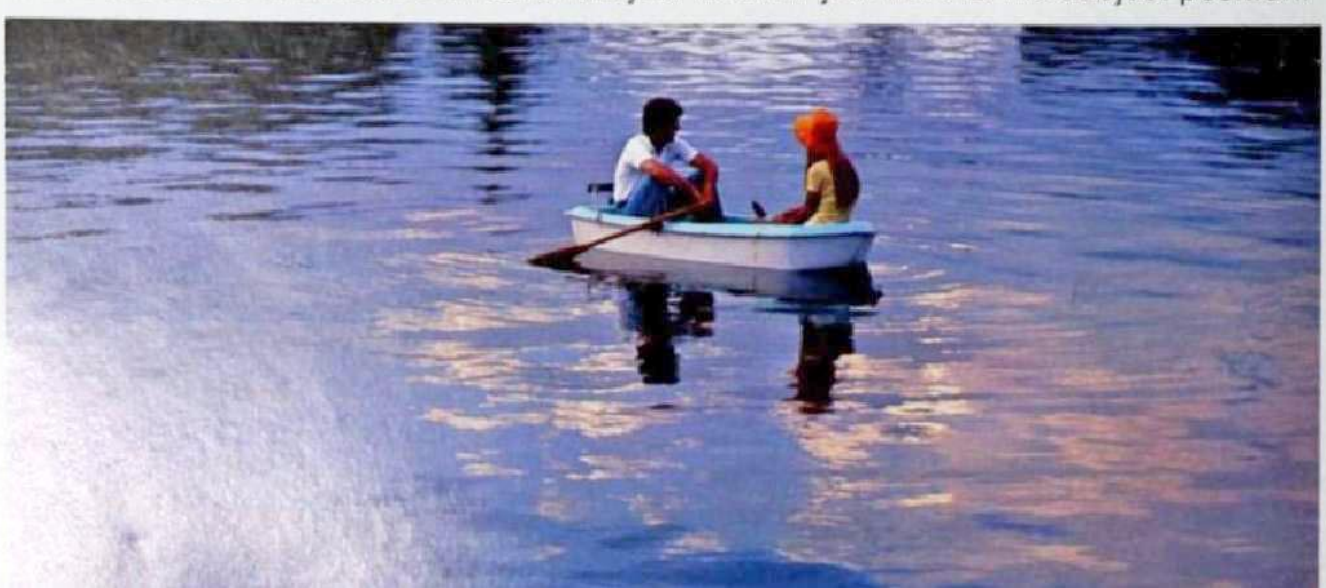
INCIDENT-LIGHT METERS

An incident-light meter measures the light illuminating the scene. To make an incident-light reading, you position your meter in the same light that's illuminating the subject and point the meter toward the camera (unless the meter instruction book recommends a different technique). When possible, hold the meter at the subject position. To do this you'll have to move close to your subject. This is the reason why cameras usually don't have incident-light meters. You can make an incident-light reading from the camera position if the light falling on the camera is the same as the light falling on the scene you are photographing. Point the meter in the same direction as you would if you were making the reading at the subject position —180° from the subject.

Exposure determined by an incident-light meter assumes that the scene has average reflectance. Fortunately, most scenes have average reflectance, and as a result the exposure indicated by an incident-light meter is correct for most picture-taking situations.

Since an incident-light meter measures the illumination on the scene, scene reflectance does not influence the

When you can't get close enough to your subject to make an incident-light meter reading at the subject position, you can make the reading from the camera position if the light falling on the camera is the same as the light falling on the subject. Remember to aim the meter in the same direction as you would if you were at the subject position.



NORM KERR

ROBERT HOLLAND

If a bright area, such as snow, is an important part of the picture, use a lens opening 1 stop smaller than your incident-light meter indicates.

meter. This means that light or dark areas in the scene will not mislead the meter. If these areas are unimportant in your picture and the principal subject has average reflectance, your picture should be properly exposed when you use an incident-light meter. Or if you are photographing an evenly lighted scene which has a large brightness range where detail in the light and dark areas is of equal importance, an incident-light meter will indicate a compromise exposure that should be correct.

On the other hand, if either a very light area or a very dark area is the important part of the picture and you want to record detail in this area, you must modify the exposure indicated by your incident-light meter. If a light area is an important part of the picture, use a lens opening ½ to 1 stop smaller than your meter indicates. If a dark area is important, use a lens opening ½ to 1 stop larger than your meter indicates. Note that these exposure corrections are just the opposite of those for reflected-light meters.

When the scene has uneven lighting and you want the best overall exposure, make incident-light readings in the lightest and darkest areas of illumination that are important to your picture. Then use the exposure that is midway between the exposure settings indicated for these areas.

Many scenes, especially those outdoors in daylight, have average reflectance. For these scenes an incident-light meter and a reflected-light meter will work equally well and yield a high percentage of good exposures.

When lighting remains constant, as it does for most of the day in bright sunlight, you can use the same exposure for similarly lighted scenes with average reflectance. As a result, for average picture-taking conditions it is unnecessary to make a separate meter reading of each scene.

2 stops overexposed—1/125 sec *f*/2.8

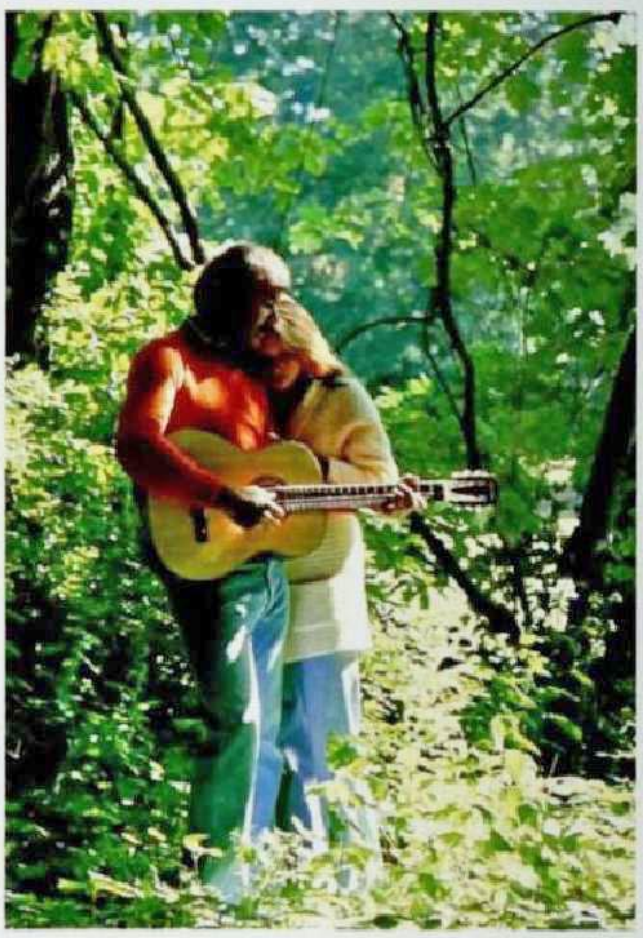
1 stop overexposed—1/125 sec *f*/4

1 stop underexposed—1/125 sec *f*/8

2 stops underexposed—1/125 sec *f*/11

EXPOSURE BRACKETING

When you encounter scenes that are unusual or that are difficult to determine the correct exposure for and you're not sure of the proper camera settings, it's a good idea to bracket your exposures. Bracketing gives you more assurance of getting a picture with proper exposure. First determine the exposure as accurately as you can with your exposure meter or from an exposure guide, and then take a picture at this setting. Next take another picture at 1 stop less exposure and a third picture at 1 stop more exposure. If you want even more assurance of a properly exposed picture, take two *more* pictures—one at 2 stops under and one at 2 stops over the exposure recommended by your meter or the exposure guide.



DON MAGGIO

Normal exposure—1/125 sec *f*/5.6. Exposure bracketing gives you more assurance of getting a picture with proper exposure. These pictures were made on KODAK EKTACHROME 64 Film (Daylight).

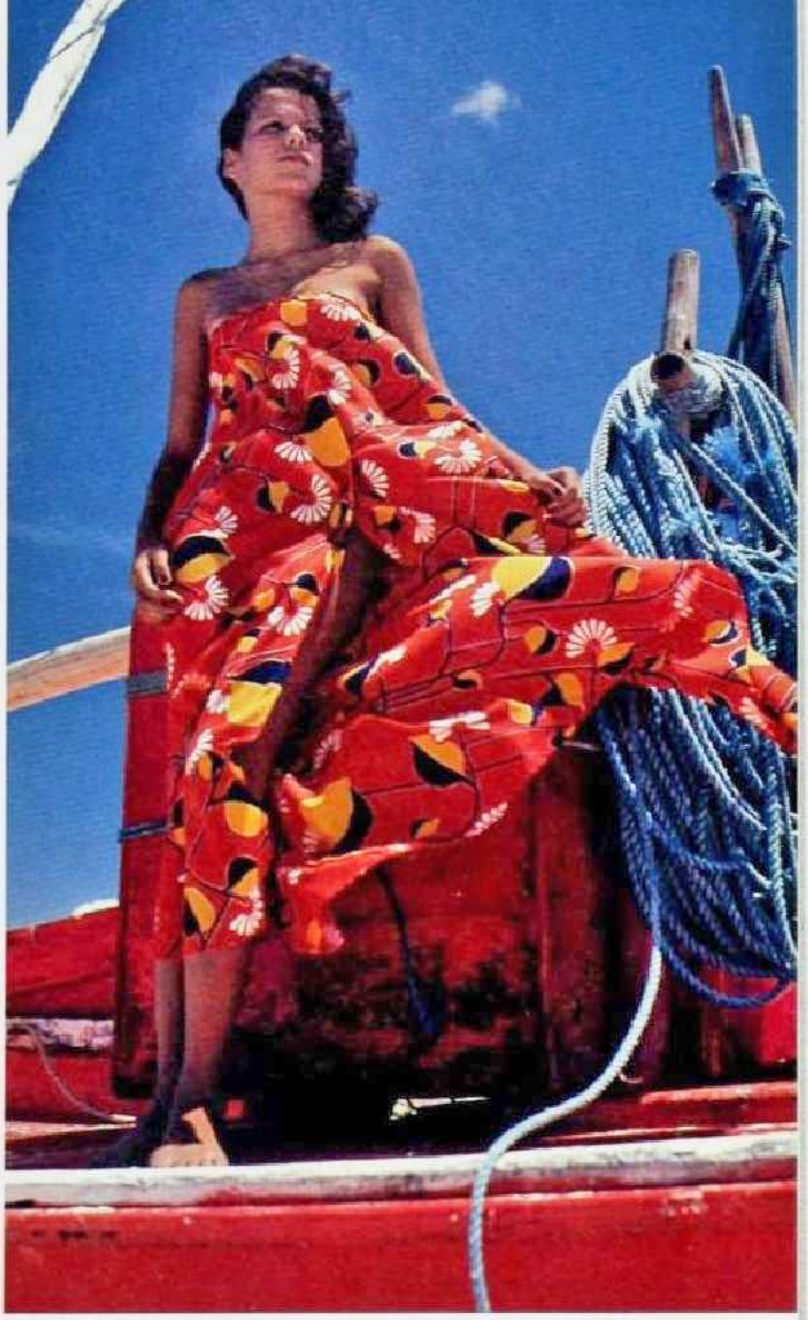
Since color-slide films have less exposure latitude than negative films it's better to bracket the estimated exposure as described using ½-stop increments in order to get the best exposure.

EXPOSURE WITH FILTERS

Since most filters absorb light, you must make an exposure compensation when you use them. With Kodak color films and the conversion filters recommended for various light sources, the compensation is included in the film speed given for each light source and filter combination. Use the speeds given on the instructions that come with the films or in the Data Sheets in this book. With Kodak black-and-white films, filter factors are given on some film instructions and the Data Sheets. Divide the film speed by the filter factor to make the exposure compensation. Then set the corrected speed value on the film-speed dial of your camera or exposure meter.

Another way you can apply the filter factor for black-and-white film is to set your exposure meter for the speed of the film without a filter and then modify the camera settings indicated by the meter. For example, if the filter factor is 2 and the camera setting indicated by the meter reading made without a filter is 1/125 second at *f*/11, you can either double the exposure time to 1/60 second or open the lens 1 full stop to *f*/8. See the filter factor table on this page.

The methods described so far are for determining exposure for filters for use with separate exposure meters or cameras that *do not* make the meter reading through a filter used over the lens. Many cameras with built-in exposure meters though, measure the light through a filter placed over the camera lens. With most cameras of this type, you should set the built-in meter for the speed of the film *without a filter*. However, with some filters, built-in exposure meters that make the reading through

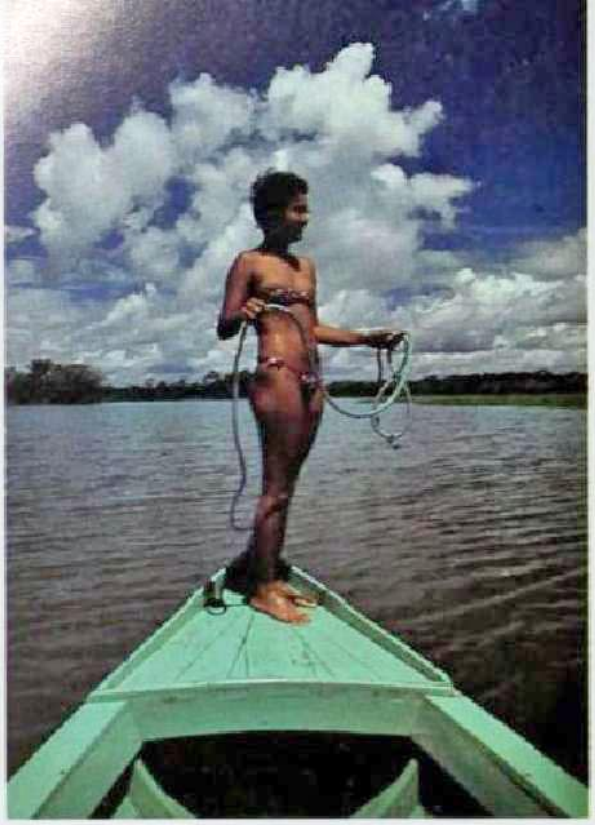


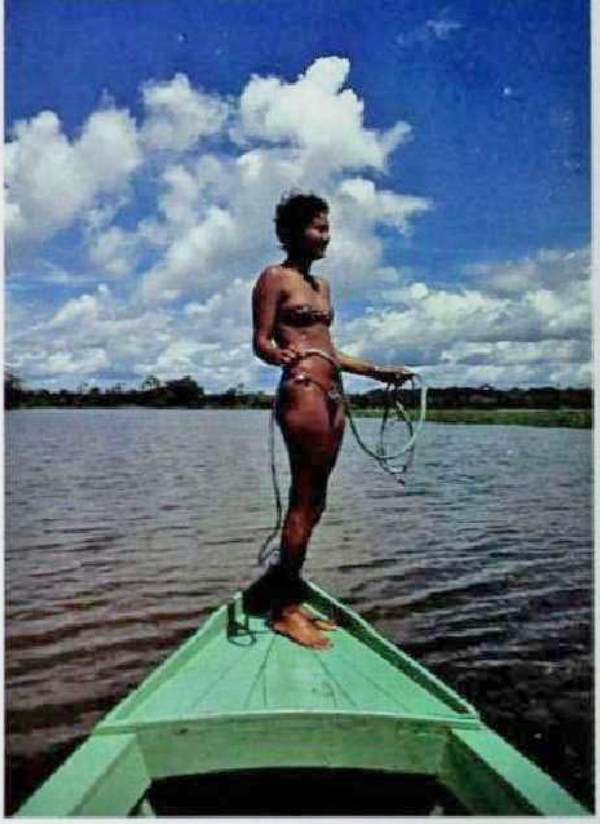
NEIL MONTANUS

Colors are reproduced with more saturation when you use a polarizing screen. KODACHROME 64 Film (Daylight), 1/125 sec *f*/5.6

EQUIVALENT *f*-STOP CORRECTIONS FOR FILTER FACTORS

Filter Factor	*f*-Stops	Filter Factor	*f*-Stops	Filter Factor	*f*-Stops
1.2	+ ⅓	3	+1⅔	8	+3
1.5	+ ⅔	4	+2	10	+3⅓
2	+1	5	+2⅓	12	+3⅔
2.5	+1⅓	6	+2⅔	16	+4





NEIL MONTANUS

A polarizing screen with a filter factor of 2.5 was used to produce the dramatic sky in the picture on the left. To determine the correct exposure, divide the film speed by 2.5 or increase exposure by 1⅓ stops. These exposure corrections are for use with meter readings made without the polarizing screen. Because of differences in camera exposure meter systems and the rotation position of the polarizing screen relative to the light from the scene, you should not rely on meter readings made through a polarizing screen. KODACHROME 64 Film (Daylight)

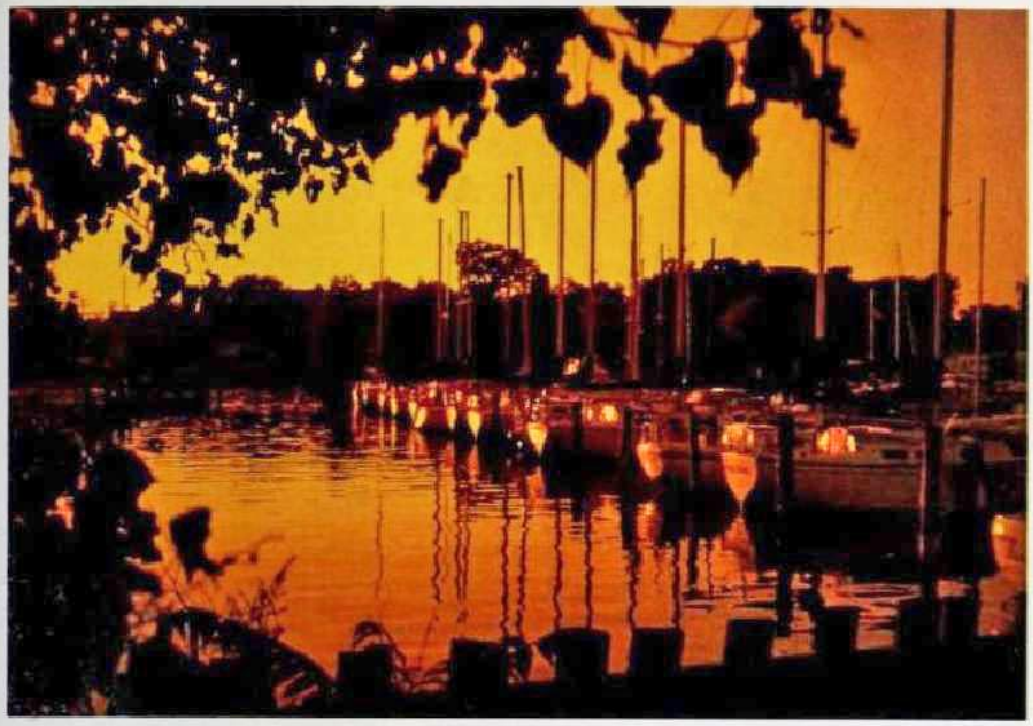
the filter may require a correction in the film-speed setting to indicate the proper exposure. This is necessary since the meter and the film may not respond to colored light the same for exposure. Therefore, since camera instructions vary, check your instruction manual for details on how to set your camera.

If your camera manual doesn't adequately cover this situation, you can write for such information to the manufacturer or the American distributor for your camera. Or you can determine your own correction factor for filters by using the following procedure.

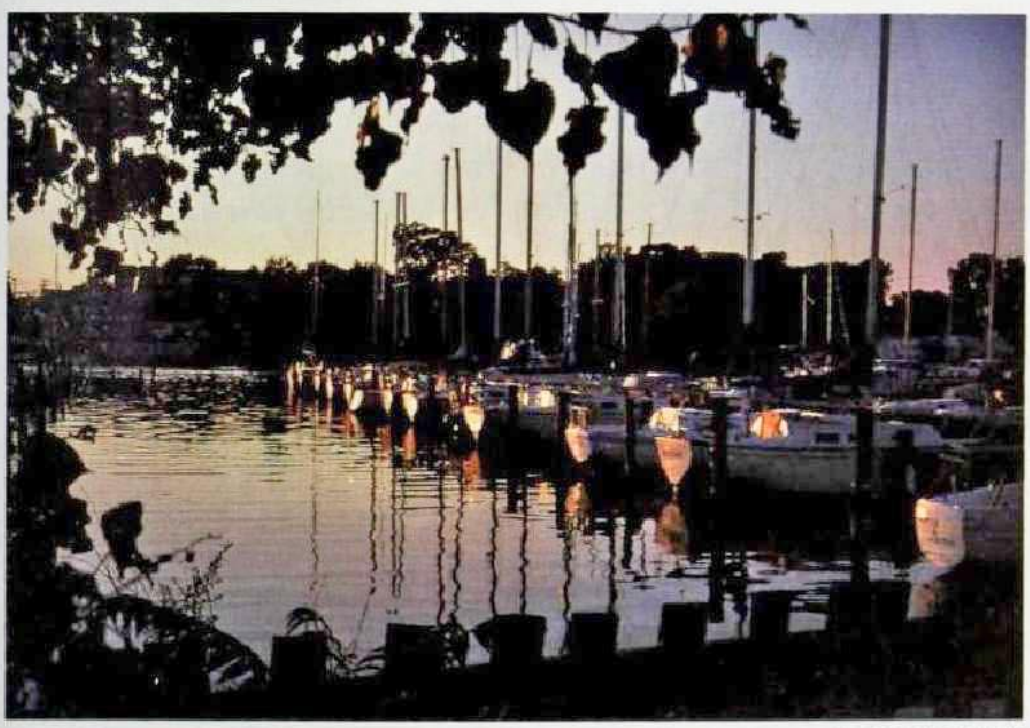
Select an average scene that's typical of the type of scenes and lighting you'll photograph using a particular filter. The lighting should remain constant and the subjects should not change while you're making comparative exposure meter readings for this test.

Put your camera on a tripod. For *color film*, set the film-speed dial on your camera for the speed of the film *with the filter*. For *black-and-white film*, divide the speed of the film by the filter factor for the filter you're using and set the resulting number on the film-speed dial of your camera. Next make an exposure meter reading with your camera *without using the filter*. Note the shutter speed and *f*-number indicated by the meter reading. This tells you what the exposure should be *with* the filter.

Without moving the camera, put the filter over the lens and make an exposure meter reading of the same scene with the same lighting through the filter with your camera. Do not change the exposure settings; keep the same shutter speed and *f*-number as before. Then adjust the film-speed dial on your camera to center the exposure meter needle or, depending on the exposure determination system in your camera, adjust the film-speed dial to obtain the same shutter speed and *f*-number



With No. 21 orange filter



No filter

CAROLINE GRIMES

You can often use filters for creative picture-taking. Here the photographer put a No. 21 orange filter over the camera lens for the top picture taken at sunset in order to create a more colorful photo. Usually with this filter technique, making the meter reading through the filter gives good exposure.

combination. For example, with automatic cameras the exposure meter determines either the shutter speed or the lens opening or both.

Note the new ISO (ASA) setting on the film-speed dial. This shows you what the film speed should be for your camera when making meter readings through the filter.

Compare this new ISO (ASA) setting with the film speed recommended for the film *without a filter*. This is the correction to use for the film, filter, and lighting conditions you used to make the test. You can make the same correction for other films for use with this filter.

For example, if the film has a speed of ISO (ASA) 64 *without a filter* and you find from your meter-reading test that it should be ISO (ASA) 50 when you make the meter reading through the filter with your camera exposure meter, then divide 50 by 64. The answer 0.8 is the multiplication-correction factor by which you should decrease (or increase for factors greater than 1) the speeds of other films for use with this

filter when you make the meter reading through the filter.

Note that some black-and-white films have different basic filter factors for the same filter. For these exceptions, you'll need to make a separate exposure meter test to find the correction for each film that has a filter factor different from the film you used for your original test.

EXPOSURE FACTOR FOR SHUTTER EFFICIENCY

When you take pictures on high-speed film under certain conditions, there is an additional exposure factor you should consider. If you're using a camera with a leaf-type shutter under exposure conditions that require high shutter speeds and medium or small lens openings, lens openings beginning about midway on the lens-opening scale of your camera, significant overexposure will result unless you make an exposure correction. This happens because shutter speeds are calibrated at the maximum lens opening of the camera, but shutter efficiency with a leaf-type shutter changes as the lens opening is decreased. At high shutter speeds and medium or small lens openings, the effective exposure times are longer than the shutter-speed settings indicated on your camera. At slow shutter speeds the difference between the effective exposure time and the indicated shutter-speed setting is relatively insignificant, and you can ignore it.

The exposure error may be equal to a half stop at 1/250 second and a full stop at 1/500 second. Because of the short exposure latitude of color-slide films, the exposure error is more critical for high-speed color-slide films than for high-speed color and black-and-white negative films. To correct for the exposure error, you should reduce the lens opening 1/2 stop at 1/250 second and 1 full stop at 1/500 second when exposure-meter readings indicate medium or small lens openings. *No such correction is necessary when you use a camera with a focal-plane shutter.*

These exposure corrections are given in the daylight exposure table on the Data Sheets for KODAK EKTACHROME 200 and 400 Films (Daylight) and on the instruction sheet supplied with the KODAK Special Processing Envelope, ESP-1.

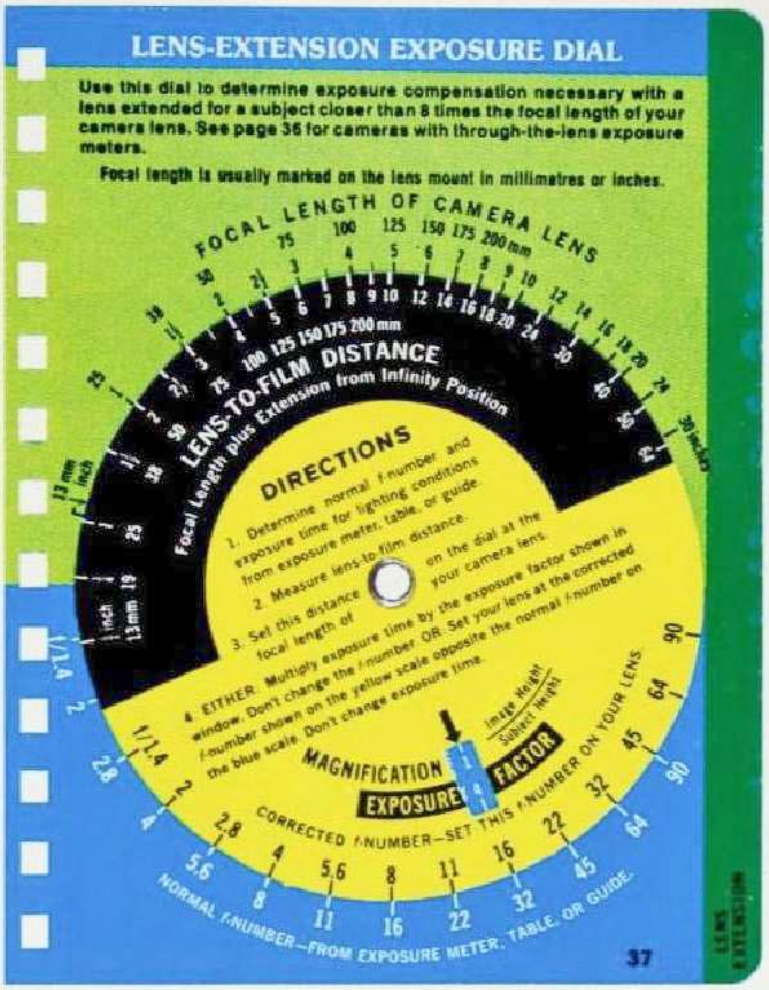
When you use high shutter speeds and medium or small lens openings with a camera that has a *leaf shutter*, you should use a smaller lens opening than normal. This exposure correction is more important for taking pictures on high-speed color-slide film than it is for high-speed negative films because the negative films have more exposure latitude.

DON MAGGIO

USING EXPOSURE METERS IN COPYING

It's important that you adjust the lights so that the illumination over the copy area is even. To determine exposure for copying, you can either use an incident-light meter held in the plane of the original you are copying or use a reflected-light meter and take the reading from a gray card with 18-percent reflectance that you have substituted for the original. You can use the gray side of the KODAK Gray Card for this purpose. If you don't have the proper gray card, you can make a reflected-light reading from a matte white surface of 90-percent reflectance, such as the back of a sheet of double-weight white photographic paper. Your meter reading, of course, will be much higher. Compensate by setting the meter calculator or film-speed dial at 1/5 the normal film-speed number.

The film speeds for copying linework are intended for trial exposures. The exposure for linework is affected by the reflectance of the lines or dark areas of the original and the inherently short exposure latitude of high-contrast films. To obtain the best contrast between the background and the lines, you should use the maximum exposure that you can without causing filling-in or grayness of lines on the negative.


LENS-EXTENSION EXPOSURE DIAL
Use this dial to determine exposure compensation necessary with a lens extended for a subject closer than 8 times the focal length of your camera lens. See page 36 for cameras with through-the-lens exposure meters.
Focal length is usually marked on the lens mount in millimetres or inches.
FOCAL LENGTH OF CAMERA LENS
LENS-TO-FILM DISTANCE
Focal Length plus Extension from Infinity Position
DIRECTIONS
1. Determine normal f-number and exposure time for lighting conditions from exposure meter, table, or guide.
2. Measure lens-to-film distance.
3. Set this distance on the dial at the focal length of your camera lens.
4. EITHER: Multiply exposure time by the exposure factor shown in window. Don't change the f-number. OR: Set your lens at the corrected f-number shown on the yellow scale opposite the normal f-number on the blue scale. Don't change exposure time.
MAGNIFICATION
Image Height / Subject Height
EXPOSURE FACTOR
CORRECTED f-NUMBER—SET THIS f-NUMBER ON YOUR LENS
NORMAL f-NUMBER—FROM EXPOSURE METER, TABLE, OR GUIDE
37

The *KODAK Master Photoguide* (AR-21) includes a handy Lens-Extension Exposure Dial for determining the effective *f*-number quickly and easily when you're using a lens-extension device.

CORRECTION FOR LENS EXTENSION

In computing the exposure for copying or other close-up work for which you extend the camera lens by using extension tubes or bellows, make sure you allow for the effective increase in the indicated *f*-number unless your camera does this automatically. Otherwise, your pictures will be underexposed. For example, if you ignore this factor when determining exposure for taking a close-up picture of an object that will be the same size in your picture or a ratio of 1:1, your film will be underexposed by 2 *f*-stops. You should make an exposure compensation whenever the subject distance is less than 8 times the focal length of your lens. Close-up lenses require no exposure compensation unless you use a lens-extension device. The *KODAK Master Photoguide* (AR-21)

$$\text{Effective } f\text{-number} = \frac{\text{Indicated } f\text{-number} \times \text{Lens-to-film distance}}{\text{Focal length}}$$

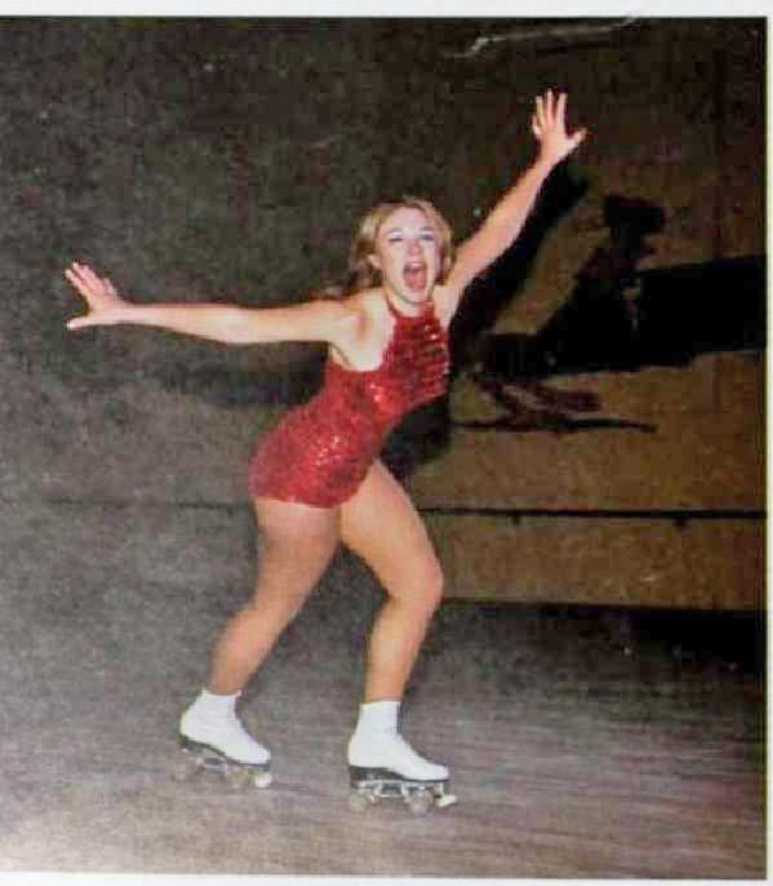
provides a convenient calculator dial for determining the effective *f*-number quickly and easily.

You can also calculate the effective *f*-number by using the formula on page 105. The lens-to-film distance is approximately equal to the focal length of your camera lens plus the distance the lens is extended beyond its position at infinity focus.

If your camera has a through-the-lens exposure meter that works with a bellows extension or extension tubes on the camera, the camera makes the exposure compensation automatically so you don't have to make the correction yourself. When you're using flash, you usually have to make the exposure compensation manually for lens extension. Some cameras, though, do this automatically also. Check your camera, flash, and close-up equipment instruction manuals.

CHARLES A. CARNAGHI, KINSA

Many electronic flash units determine the correct exposure automatically.



PETER GALES

Flash guide numbers provide a reliable method for determining exposure with nonautomatic electronic flash units and flashbulbs.

MODIFYING FILM-SPEED NUMBERS

Film speeds published by film manufacturers are an excellent basis for obtaining optimum exposure. Optimum exposure is the minimum exposure required to produce a picture of excellent quality. Underexposure results in less density, or blackness, in your negatives or more density in your slides and loss of shadow detail in both. Overexposure increases negative density or decreases slide density and results in a loss of highlight detail in both. Furthermore, overexposure in negatives increases graininess (with conventional black-and-white films), reduces sharpness, increases printing time, and makes focusing the enlarger more difficult.

To produce the quality you want in your pictures with your own equipment and procedures, it's sometimes necessary to modify recommended film-speed numbers. However, before you depart from the film speed recommended for a particular film, be sure that you are making careful exposure-meter readings using the technique recommended in your meter or camera instruction book. Then if your pictures are consistently unsatisfactory and indicate that you

should change the film-speed setting on your meter, change it as follows: With normal development, if your films are consistently underexposed, increase exposure by using a lower film-speed number; if your films are consistently overexposed, reduce exposure by using a higher film-speed number. Divide the published film speed by 2 to produce 1 stop more exposure. Multiply by 2 to produce 1 stop less exposure.

FLASH EXPOSURE

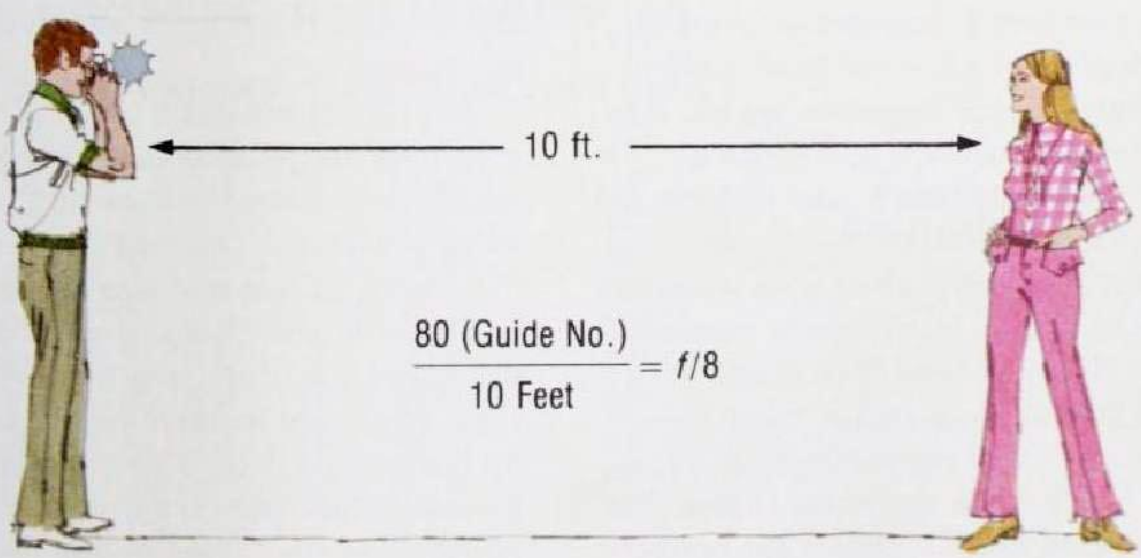
The most important factor affecting flash exposure for a specific film and flash unit is the distance from the flash to your subject. Subjects close to the flash receive a lot of light, while subjects farther away receive less light. Many electronic flash units automatically adjust the light from the flash for proper exposure, and some cameras automatically adjust the lens opening for the proper flash exposure as you focus the lens. With nonadjustable cameras, flash-to-subject distances of about 5 to 15 feet (1.5 to 4.5 metres) usually produce acceptable exposures. See your camera manual. With most adjustable cameras, however, flash guide numbers provide a convenient means for determining flash exposure.

The guide number you should use depends on the film you're using and on the output of your electronic flash unit. If you're using flashbulbs, the guide number depends on the film, the type of flashbulb and reflector, the shutter speed, and the synchronization of your shutter. Flash exposure tables in the Data Sheet for each film give the recommended guide numbers for different combinations of these variables.

Divide the proper guide number by the flash-to-subject distance in feet to find the *f*-number for average subjects. For example, if your guide number is 80 and the subject is 10 feet away from the flash, divide 80 by 10. The answer 8 means that you should set your lens opening at *f*/8. If the answer is between two *f*-numbers marked on your camera lens, set the lens opening at the nearest *f*-number or halfway between the two, whichever is closer to the answer.

When using guide numbers, always use the distance units for which the guide numbers are calculated—feet or metres. You use guide numbers for metres in the same way as those for feet. Just divide the guide number for metres by the flash-to-subject distance in metres to obtain the *f*-number. In this book the guide numbers that are provided are for feet.

Guide numbers are just *guides;* they are for average subjects in average-size rooms. They don't take into account



The most important factor affecting flash exposure for a film and flash unit is the distance from the flash to your subject. To determine the *f*-number for average subjects, divide the proper guide number by the flash-to-subject distance in feet.

PETER GALES

Most flash units have convenient-to-use calculator dials to tell you the *f*-number setting for the speed of the film you're using and the flash-to-subject distance.

subjects that are lighter or darker than average or small rooms with light-colored walls that reflect a lot of light. If you're photographing a light subject, use a lens opening ½ stop smaller than the guide number indicates; for a dark subject, use a lens opening ½ stop larger. In small rooms with light-colored walls, use 1 stop less exposure than the guide number indicates.

If necessary, you can change the guide numbers to improve your results. If your pictures are consistently underexposed—if your negatives are too light or your slides are too dark—use a lower guide number. If your pictures are consistently overexposed—if your negatives are too dark or your slides are too light—use a higher guide number.

The *KODAK Master Photoguide* (AR-21), described earlier, takes the arithmetic out of calculating flash exposure. It includes a convenient Flash Exposure Dial which indicates the correct *f*-number opposite each subject distance. The flash dial in the *Master Photoguide* provides a quick and easy method for determining the *f*-number setting for both electronic flash and flashbulbs.

Flash pictures of distant subjects, such as sports or other spectator events at distances of about 50 feet (15 metres) or farther away, are not very satisfactory. The foreground is usually shown as a large overexposed area which is distracting and spoils the picture. You can photograph these distant subjects much more effectively by the existing light.

You should *not* use flash to photograph the image on your television screen or projected images such as slides or movies. The bright light from the flash would overwhelm the image you want to photograph and all you would get is a blank area on the film. Here again, photograph these subjects by the existing light. You may want to purchase the book on existing-light photography described on the inside back cover.

This shot was taken with one electronic flash unit bounced from a reflecting umbrella which gives a soft, natural lighting effect. Since some light is lost when you bounce the flash off an umbrella, you must use about 1 stop more exposure than the exposure required for direct flash. TRI-X Pan Film, 1/60 sec *f*/11

KEITH BOAS

DIN FILM SPEEDS

In some countries outside the United States DIN film speed numbers are used to specify the speed of a film and to determine exposure settings on exposure meters and cameras with built-in exposure meters. The DIN series of speed numbers are different from ASA speed numbers, but you use the DIN speeds in the same way with your equipment when it has a DIN film speed dial.

Similarly to ASA speeds, ISO film speeds for the DIN system are being provided by manufacturers in anticipation of worldwide use and are numerically the same as DIN speeds. As explained on page 87, ASA speeds are now being designated as ISO (ASA) speeds.

DIN film speeds are identified as DIN or ISO with the degree sign by the number. For example, ISO (ASA) 64 speed would be given as 19 DIN or ISO 64/19°. The number immediately after ISO, 64 in this example, is the ISO (ASA) speed and the number with the degree sign, 19°, is the ISO (DIN) speed. Both ISO (ASA) and ISO (DIN) film speeds are printed on most Kodak film cartons. See the format by the table below. Most photographic equipment sold in the United States is for use with the ISO (ASA) speed system.

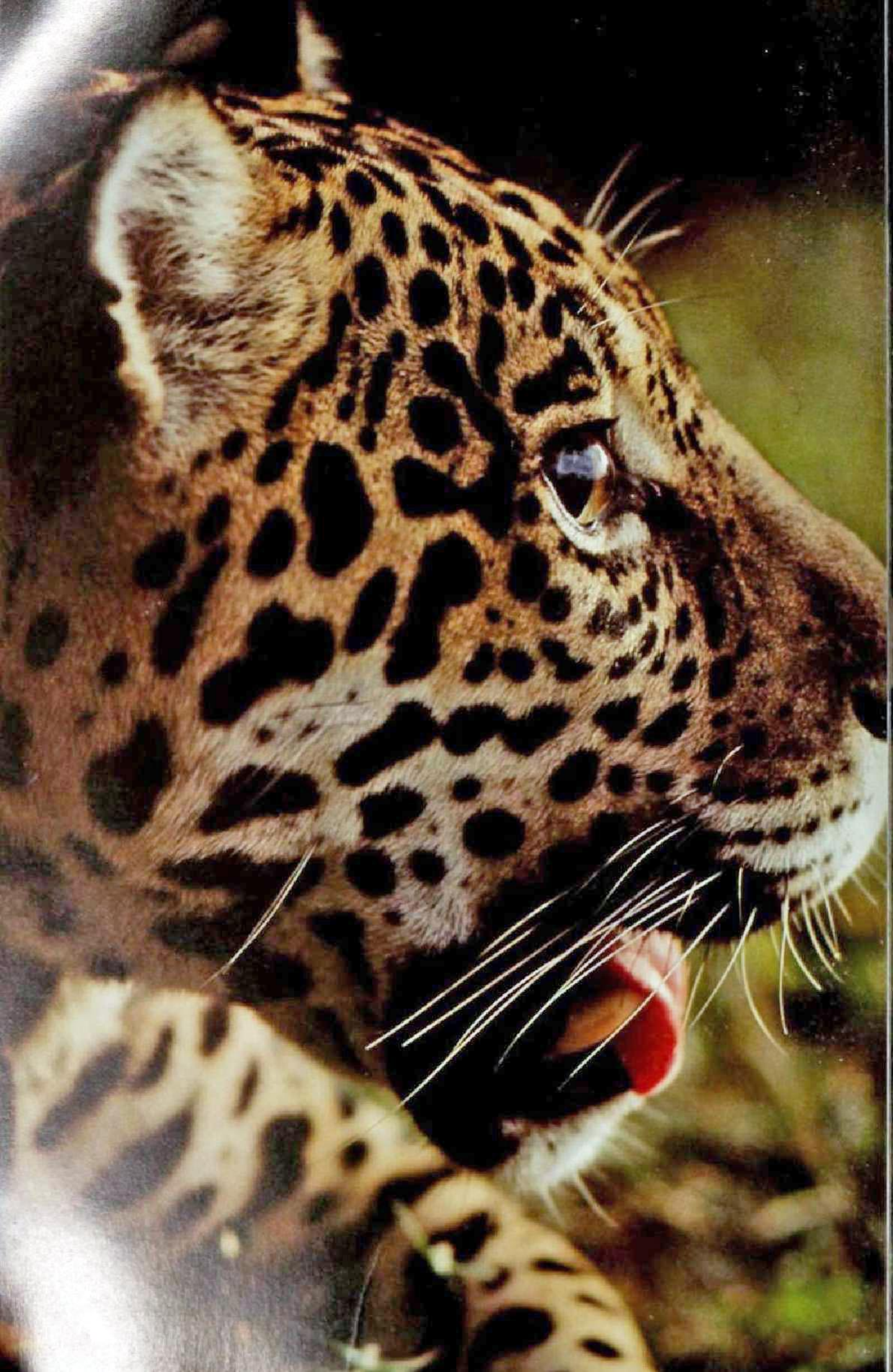
The following table is for converting ISO (ASA) speeds to ISO (DIN) speeds.

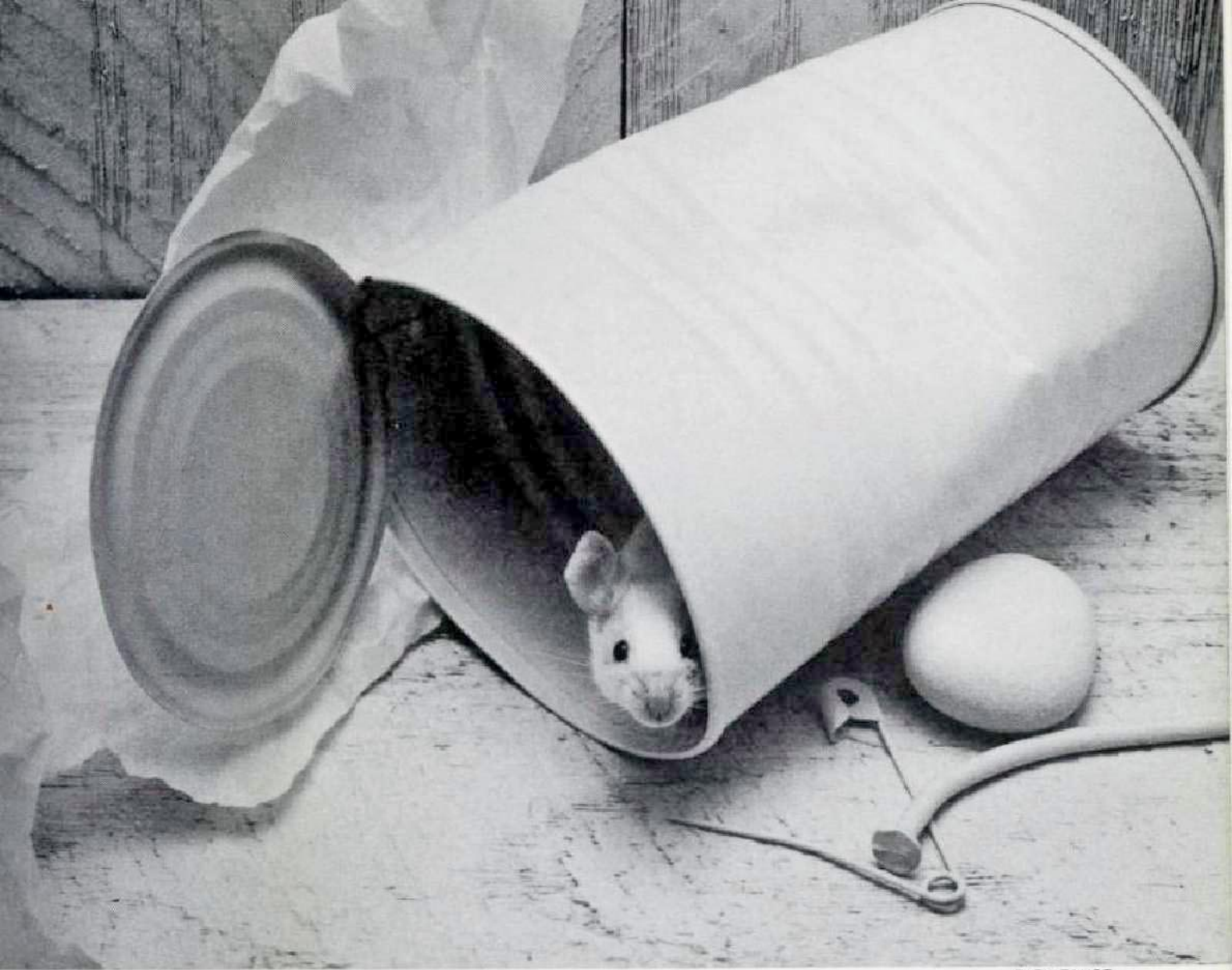
ISO (ASA)/ISO (DIN) FILM SPEEDS

ISO (ASA)	ISO (DIN)	ISO (ASA)	ISO (DIN)
6	9°	160	23°
8	10°	200	24°
10	11°	250	25°
12	12°	320	26°
16	13°	400	27°
20	14°	500	28°
25	15°	640	29°
32	16°	800	30°
40	17°	1000	31°
50	18°	1250	32°
64	19°	1600	33°
80	20°	2000	34°
100	21°	2500	35°
125	22°	3200	36°

Format used on Kodak film cartons

DAYLIGHT	
ISO 64/19°	
ASA 64	19 DIN





DICK FAUST

Storage and Care of *Kodak* Films

Photographic films are perishable products and are damaged by high temperatures, high relative humidities, and harmful gases. Some photographic characteristics—speed, color balance, and contrast of color films and speed, contrast, and fog level of black-and-white films—change gradually after manufacture. Adverse storage conditions accelerate these changes. Color films are more seriously affected than black-and-white films because adverse conditions usually affect the three emulsion layers of a color film to different degrees. Moisture may also cause various physical defects such as mottle and abrasions.

For best results, handle and store unprocessed films properly both before and after exposure, with adequate protection against heat, moisture, and harmful gases. Unprocessed films must be protected from x-rays and radioactive substances. When the climate is moderate, storage precautions are few and simple. Greater care is necessary under hot and humid conditions. Processed films also require proper storage and care for long-term keeping.

KTACHROME 200 Film (Daylight)
EIL MONTANUS

JERRY MC CUNE, KINSA

PANATOMIC-X Film

STORAGE IN THE ORIGINAL PACKAGE

Kodak supplies 135, 126, 110, roll, and 144 instant color films in water-vapor-tight packaging. The 135 films are packaged in snap-cover plastic cans; the other films in heat-sealed foil pouches. The vaportight packaging provides necessary protection from humidity in areas such as tropical regions or any other locality where high relative humidities (RH) prevail. You may encounter such conditions in a number of areas, especially during the warm summer months.

Protection from Humidity. Kodak films supplied in vaportight packaging require no additional protection against high humidities until you open the package. *So don't open the vaportight packaging until you are ready to use the film.* Otherwise the protection originally provided is no longer effective.

You can determine the relative humidity with a humidity indicator such as the type sold for home use.

Protection from Heat. *Vaportight packaging is not heatproof.* Regardless of the type of packaging, don't leave your films near heat registers, steam

KODACHROME 64 Film (Daylight), 1/4 sec *f*/5.6, 24 mm lens

NEIL MONTANUS

pipes, or other sources of heat. In warm weather, do not leave them in areas on the top floors of uninsulated buildings or in hot places in a car, especially when it's parked in the sun on a warm or hot day.

As we mentioned earlier, Kodak color-negative films and Kodak color-slide films are both available in films designed for general use and in films designed for professional use. The requirements for storing and handling color films for critical photography by professional photographers are more rigid than those for films for general use.

When Kodak color films for general use are made, the changes in speed, color balance, and contrast that will occur from natural aging are anticipated. The film is manufactured to have optimum quality when it is most likely to be used by the photographer. Kodak color films for general use are designed for storage at normal room temperature before use. The film should be protected from heat.

Kodak professional color films are designed for optimum performance to make the best pictures at the time of manufacture without regard for changes that may occur under general, or non-professional, use. To retain the original characteristics for critical photography where small color deviations would be important, professional color films should be stored under refrigeration before exposure.

Most Kodak films for professional use and for general use are equally as stable for photographic quality when they are used under identical conditions.

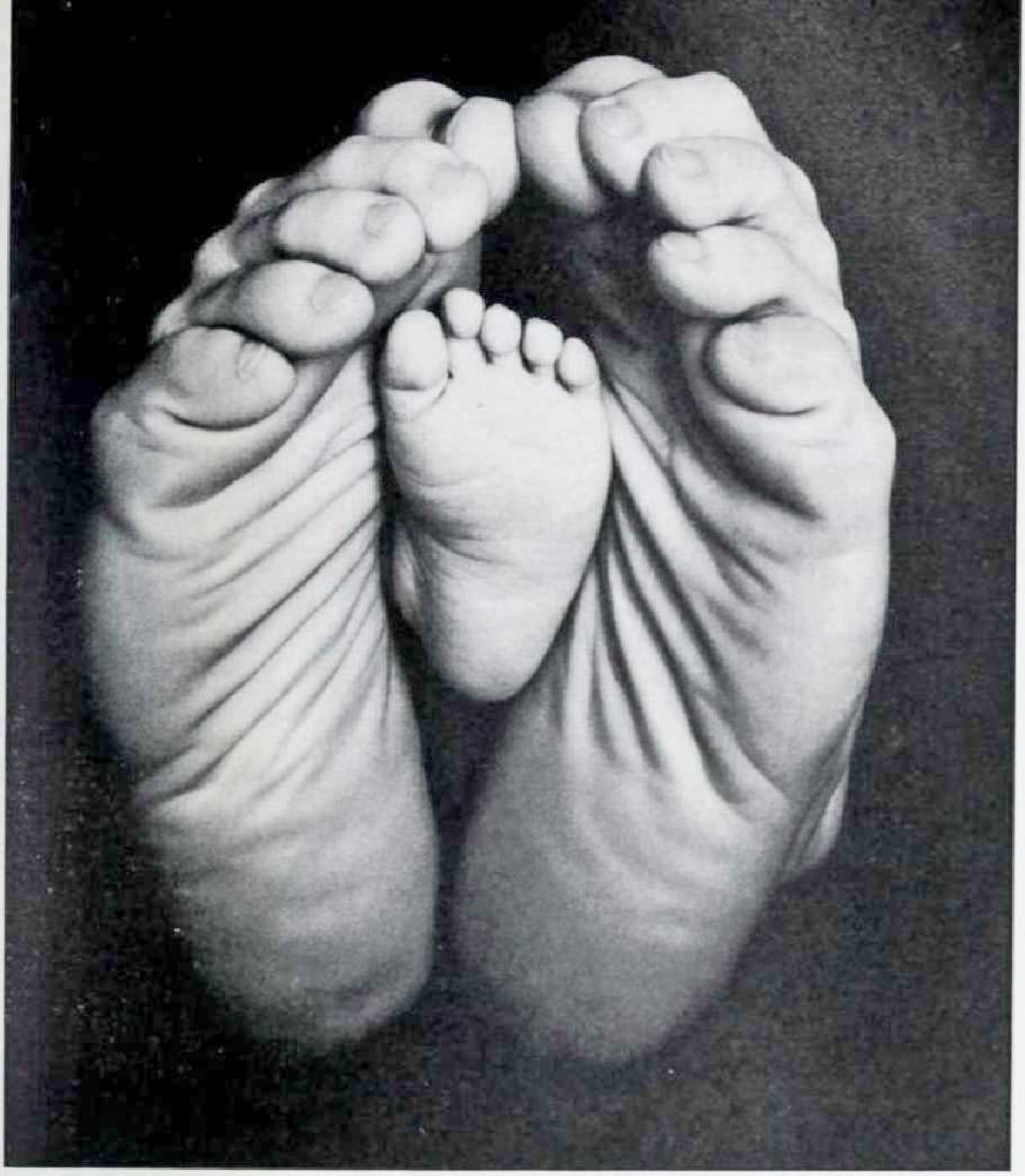
For normal temperature conditions, 75°F (24°C) or below, Kodak color films for general use and most Kodak black-and-white films do not require refrigeration. The film carton and the instruction sheet packaged with some films tell how to store the film. The storage recommendations for Kodak films for general use say PROTECT FROM HEAT; those for Kodak professional black-and-white films say STORE IN A COOL, DRY PLACE; and those for Kodak professional color films that should be refrigerated say STORE AT 55°F (13°C) OR LOWER. Some special-purpose films such as KODAK EKTACHROME Infrared Film 2236 require storage at 0 to −10°F (−18 to −23°C) and KODAK High Speed Infrared Film and KODAK EKTACHROME Slide Duplicating Film 5071 at 55°F (13°C) or lower.

During summer heat, with temperatures over 75°F (24°C) for extended periods of time, we recommend refrigerated storage for keeping all Kodak films cool, provided they are in vapor-tight packages or in sealed cans or jars. To avoid condensation of moisture on cold film surfaces, remove unopened film packages from cold storage and allow 2 to 4 hours for them to reach approximate room temperature before you open the package. This recommendation also applies to KODAK Instant Color Film that has been stored under refrigeration at 55°F (13°C) or lower but not at freezing temperatures. If this film has been stored in a freezer at 0 to −10°F (−18 to −23°C), allow 12 hours for the film to reach approximate room temperature before you use it.

When the ambient temperature has returned to normal, 75°F (24°C) or below, remove Kodak color films for general use from refrigerated storage so they can age normally as anticipated in manufacture.

If after testing some rolls of film, you want to maintain the film at that specific color balance for an extended period, you can store other rolls of the same emulsion in a refrigerator or freezer. The emulsion number is printed on the film carton.

You can store unexposed black-and-white films under normal temperature conditions, temperatures that don't exceed 75°F (24°C). For storage over long periods of time, it's desirable,



CRAIG STEWART, SKPA

TRI-X Pan Film, electronic flash, 1/60 sec *f*/16

when possible, to maintain the following storage temperatures for black-and-white films:

For storage periods up to	2 months	6 months	12 months
Keep black-and-white films below	75°F 24°C	60°F 16°C	50°F 10°C

When you're traveling in a car, don't leave your film in a closed car parked in the sun on a warm, sunny day. The temperature can quickly reach 140°F (60°C) or more. If this is unavoidable, keep your film in an insulated container, such as an ice chest like those used for camping or an insulated picnic bag.

Avoid keeping your film in the glove compartment, on the rear window shelf, over hot spots on the car floor, or in areas in direct sunlight inside the car.

The coolest area for protecting your film from heat in a car in the sun is in the passenger compartment with the air conditioner on or the windows open, especially when the car is moving. The best location is on the car floor in the shade away from hot areas over the exhaust system or transmission. With a light-color car parked in the sun on a warm or hot day with the engine off and windows closed, the car trunk is usually somewhat cooler and is a better storage area for the insulated container than the hot passenger compartment. With a dark-color car the passenger compartment, though hot, is usually

slightly cooler than the trunk. However, if there is a build-up of heat from the engine and exhaust system in a parked car after traveling at highway speeds, it may be better to put your insulated film container in the trunk which, although hot, may be slightly cooler than the passenger compartment. It's good practice to limit subjecting your film to heat in a car during warm or hot weather to as short a time as possible.

If ice or cold packs are available, you can use them to help keep your film cool. If you use ice, keep the film packages dry. Also, see "Protection of Films After You Open the Package," page 118.

ARDEAN MILLER

NEIL MONTANUS

KODACHROME 25 Film (Daylight), 1/250 sec f/5.6

Expiration Date. *Use the film promptly.* You should expose and process each roll of Kodak film before the expiration date printed on the package. Films kept beyond this date may be unsatisfactory due to changes in speed, contrast, fog, stain, color balance, and color reproduction. The last three effects, of course, apply only to color films. The magnitude of changes in a film is largely dependent on the conditions of storage. Proper storage conditions decrease the rate of changes inherent in films but won't eliminate changes entirely.

Protection from X-rays. X-ray equipment can fog your unprocessed film when the radiation level is high or the film receives several low-level doses. The effect of exposure to x-rays is cumulative. Film which has been processed, however, is not affected.

For the protection of travelers, many airports, airlines, and law-enforcement agencies around the world are using electronic devices to check passengers and x-ray equipment to check their luggage for concealed bombs and weapons. If you travel by commercial airline, your luggage may be subjected to x-ray examination each time you prepare to board the aircraft. All carry-on luggage is x-rayed unless you can obtain a visual inspection instead. Checked luggage may also be x-rayed.

While some x-ray exposure can usually be tolerated, excessive amounts may result in objectionable fog and extraneous shadow images on film contained in the luggage. It is usually possible for passengers to avoid this danger to their unprocessed film by hand-carrying their supply, including loaded cameras, and requesting a *visual* rather than an x-ray inspection of it. The

VICTOR M. GUERRERO, KINSA

PANATOMIC-X Film, 1/30 sec *f*/2.8

walk-through and handheld electronic devices used at many airports to check passengers separately from their luggage, are not x-ray equipment and have no effect on film.

In the United States, at the airport boarding gates for domestic airline flights, federal regulations require that x-ray inspection be conducted only with low-output devices. These subject luggage to less than 1 milliroentgen of x-ray exposure per inspection which should not perceptibly fog camera-type films. However, since the effects of x-rays on film are cumulative, it is possible for films to be fogged by repeated exposures of less than 1 milliroentgen each but totaling 5 milliroentgens or more. So for travel within the United States, requests for visual inspections should be unnecessary—unless more than five inspections are encountered with the same film.

Visual inspection of film is particularly important when traveling abroad, including traveling by airline from international air terminals in the United States. A wide variety of luggage-inspection systems may be encountered both for checked and carry-on luggage. Some of these systems are known to operate at relatively high x-ray levels. If you are unable to obtain a visual inspection, we suggest that you ask pertinent questions of airline authorities to determine in doubtful situations whether your film can be damaged.

If you plan to use KODAK Mailers, you can send your exposed film to a Kodak Processing Laboratory instead of carrying it with you and risking exposure to x-rays.

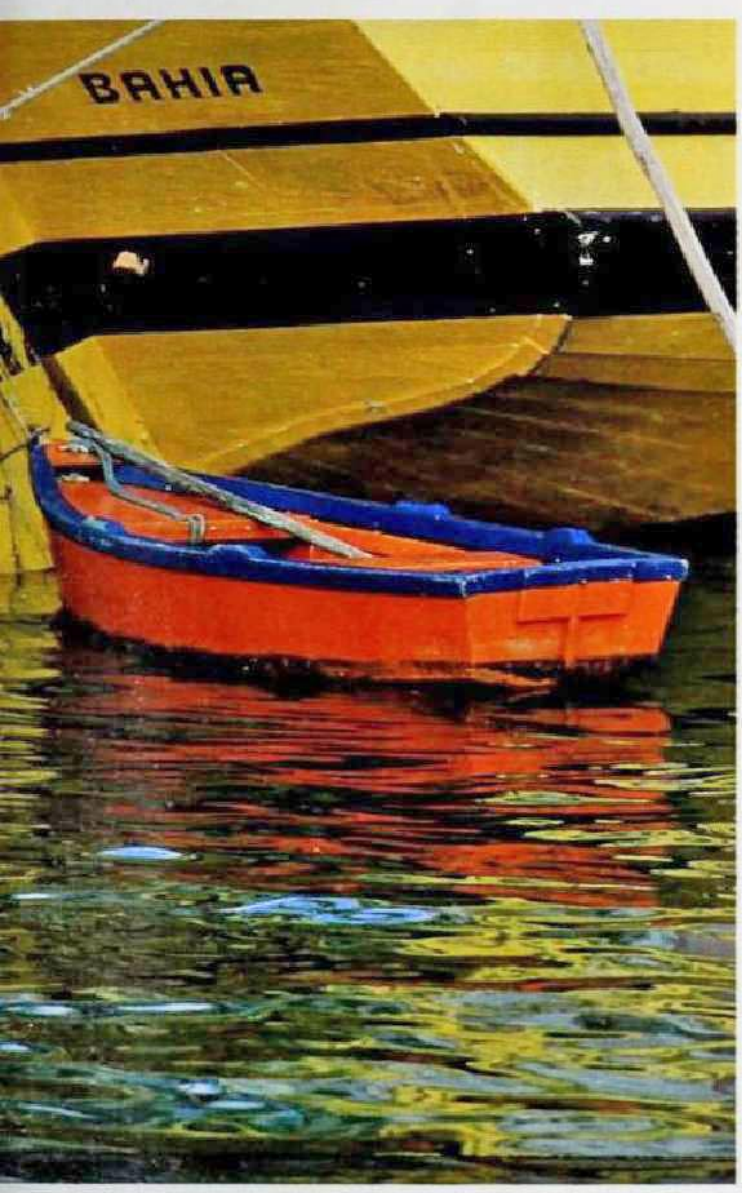
If you're in doubt about the safety of the equipment in use, or if your luggage will be examined more than five times, or when you're traveling to a foreign country, you can minimize the possibility of damage to your film in the following ways:

- Carry your film in hand luggage, arrive early, and ask airport authorities for a visual inspection at each checkpoint, stressing the fact that the sensitive photo material you're carrying might be ruined by x-rays. Not all inspectors will cooperate; however, those who do will help reduce the possibility of film damage.
- Each time you pack your bag, arrange the contents so that the film is not always oriented in the same way. You can achieve a similar effect by orienting your bag differently each time it passes through x-ray inspection.
- Carry KODAK Mailers or other mailers provided by photofinishers on your trip, and mail each roll of film in for processing as soon as it has been exposed. As an added bonus, your processed film may already be waiting for you when you return home.
- If your trip will simply be from one city to another in the United States and back again, there's probably little need for concern. But the 12-countries-in-10-days, whirlwind-tour sort of trip may present a problem to your film.

Sometimes mailed packages are also x-rayed, so if you include unprocessed film in a package, label the package "Undeveloped Photographic Film. Please Do Not X-Ray." Film mailed in processing mailers provided by processors—and clearly marked as film—usually is not subject to x-ray inspection.

PROTECTION OF FILMS AFTER YOU OPEN THE PACKAGE

When the vaportight film package is opened, the film is no longer protected from the damaging effects of high humidity and harmful gases. *So expose and process your films promptly after you open the package.* When films for



NEIL MONTANUS

EKTACHROME 200 Film
(Daylight)

general use are manufactured, an average delay after exposure before the film can be processed is planned for. You get the best results, however, when you have your exposed film processed promptly. Process professional films soon after exposure. If you can't have professional film processed promptly, you should keep it refrigerated until you can have it processed

High relative humidity and high temperature often cause undesirable changes in the latent image—the undeveloped image on the exposed film. Therefore, under these conditions, it's particularly important that you have your exposed films processed as soon as possible. Do not deposit film in an outdoor metal mailbox where high temperature may occur, especially when pickup is delayed.

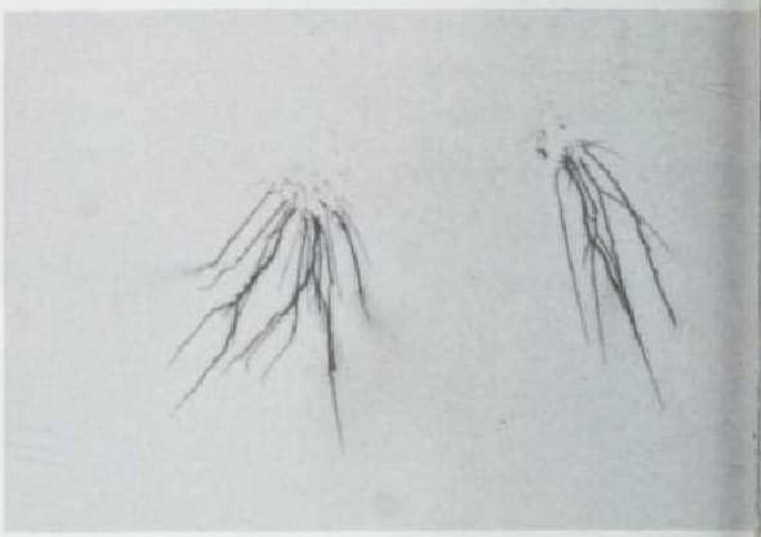
Under adverse conditions of heat or humidity, don't keep films in your camera any longer than necessary. Protect your films by keeping them in a carrying case, and shield the case from direct sunlight; otherwise, the temperature inside the case may become extremely high even in a temperate region. Similarly, don't leave your films in a closed car parked in the sun on a warm, sunny day. Follow the same recommendations for films kept in cars given on page 115 under "Protection from Heat," except that you *should not refrigerate the container* the film is kept in because there is no humidity protection for the film after you open the vaportight packaging.

Don't store opened packages of film in damp basements, iceboxes, refrigerators, or other places where the relative humidity is high. A moderate temperature and moderate relative humidity, such as 60°F (16°C) and 40 percent RH, are better than a low temperature with high relative humidity, such as 40°F (4°C) and 80 percent RH. The ideal relative humidity for storage of such film packages is between 40 and 50 percent, preferably near 40 percent.

When you can't avoid humid storage locations, or when you must store your films in a refrigerator to keep them cool, place opened packages of film in a can or jar which you can seal tightly to provide moisture protection. Instead of these containers you can put the film in KODAK Storage Envelopes for Processed Film described on page 123 even though the film has not been processed.

Or you can use three wraps of aluminum foil each tightly sealed with tape to protect the film from moisture. See page 124.

If the prevailing relative humidity is above 60 percent, dry your films with a suitable desiccating agent, such as activated silica gel, before storing them in cans, jars, KODAK Storage Envelopes or aluminum foil in humid or cold locations. You can buy silica gel from chemical-supply firms. Small, inexpensive containers of silica gel called Davison Silica Gel Air Dryers are available. Write to W. R. Grace & Co., Davison Chemical Division, P.O. Box 2117, Baltimore, Maryland 21203, for the name of a local distributor.



This is one type of static markings on film caused by static discharges. Friction generated while winding the film too rapidly in the camera is the main cause of static charges. As a rule, static is most troublesome when the relative humidity is low.

NICHOLAS C. SCOTT, KINSA

Keep opened packages of film away from chemical fumes, such as industrial gases, motor exhausts, mothballs and similar moth repellents, formaldehydes, paints, solvents, cleaners, mildew or fungus preventives, chipboard, glues, foam-in-place insulation, insecticides, sulfides, and fabric treatments, for example, permanent press and stain inhibitors. Do not store films or cameras in drawers of furniture made from chipboard or that may be contaminated with photographically harmful fumes from mothballs, mildew inhibitors, wood preservers, paints, varnishes, and wood glues. Since clothes closets often contain moth repellent chemicals or mildew and fungus preventives, check carefully to be sure you don't store films and cameras in compartments containing these chemicals.

Static. Advancing and rewinding roll film too rapidly or other careless handling can produce discharges of static electricity which cause marks on the processed film. Static discharges occur most often when the relative humidity is low, such as indoors during winter months. Marks produced by static can appear as lightning streaks, small dots, or fogging. High-speed films are more susceptible to the effects of static than are medium- or slow-speed films. When the humidity is low, you can minimize static discharges by slowly advancing the film for each picture, slowly rewinding 135 film in your camera after the last exposure, and handling the film carefully. After film has been processed, static discharges won't make marks on the film.

STORAGE AND CARE OF PROCESSED FILMS AND PRINTS

Some photographs are used for only brief periods to satisfy immediate needs while other photographs are used or stored for extended periods of time. How long a picture will be kept depends on many personal factors so that only the person who owns the picture can determine when a picture is no longer of any value. This section gives some suggestions for storage and care of negatives, slides, and photographic prints.

Storage conditions for processed black-and-white films and prints are less demanding than those for color photographs. You can store black-and-white negatives (or black-and-white slides), which are on safety base, and black-and-white prints at normal temperatures—about 70°F (21°C) or cooler. All Kodak films are now made with a safety base and have been for many years. Store black-and-white negatives and prints where it's dry, between 30 and 50 percent relative humidity. Avoid a relative humidity below 30 percent because excessive brittleness may result. High relative humidities above 60 percent are also harmful because of the possibility of mold or fungus growth. It's best to have temperature and humidity remain at constant values rather than varying up and down daily. If the temperature is moderately higher temporarily, this should cause no harm providing the relative humidity remains less than 40 percent. Temperatures exceeding 75°F (24°C) together with relative humidity exceeding 60 percent are the most damaging, causing accelerated growth of mold or fungus, deterioration of the image, fading of color images, and sticking together or glazing of film surfaces.

Since the silver image may be attacked by oxidizing gases in polluted atmosphere, protect your negatives and prints from fumes of certain sulfur compounds, such as hydrogen sulfide and coal gas and from fumes of oxides of nitrogen, peroxides, formaldehyde, ozone, and other harmful gases. Fumes from areas freshly painted with oil-base paints can cause serious discoloration of black-and-white images. Do not return black-and-white prints and negatives to a freshly painted area (oil-based paint) for at least 4 weeks after painting. No adverse effects have been found with latex paints.

For long-term keeping of processed black-and-white and color films and photographic papers, follow the processing recommendations very closely. Incorrect processing procedures, such as faulty agitation, excessive times in certain solutions, insufficient fixing, and inadequate or excessive washing, can result in defects after long-term storage that were not apparent shortly after processing. For example, insufficient time in some solutions or inadequate rinsing and washing can leave unwanted chemical residues in the film or paper which later cause harmful effects to the pictures. Commercial laboratories are aware of the important part that processing plays in the permanence of negatives, slides, and prints. If you do your own processing, carefully follow the manufacturer's instructions.

When black-and-white negatives and prints are processed properly and are stored under optimum conditions, they will last a very long time.

The long-term storage and care requirements for color negatives, color slides, and color prints are more demanding than those for black-and-white materials. The images in color photographs are formed by dyes while the images in black-and-white photographs are formed by metallic silver. In time, all

dyes may change. The dyes used in Kodak color films and color photographic papers provide the best possible stability while meeting other essential requirements.

The primary environmental factors affecting the stability of color photographs are heat, humidity, light, and cleanliness of the storage conditions. Store processed color films and color prints (see page 123) where it's dark, dry, cool, and free of contamination. You can store processed color films and color prints for extended periods of time in normal room conditions, such as in many areas on the main floors of buildings but never in damp basements or in hot attics. For color slides, color negatives, and color prints a relative humidity between 30 and 50 percent and a temperature about 70°F (21°C) or below are satisfactory. Cooler temperatures are even better for storing color photographs. Again it's best to have temperature and humidity remain constant rather than change up and down daily. Avoid a relative humidity below 30 percent because excessive brittleness may result. High relative humidities above 60 percent are also harmful because of the increased possibility of fungus growth or color changes. Keep the storage container that contains your photographs away from sources of heat, like radiators, warm-air registers, walls that may contain hot-air ducts or chimneys, and windows where sunlight can strike the container.

Dye images can deteriorate particularly when they are exposed to bright light or to normal light levels for a long period of time. Therefore, dark storage is best for color photographic materials. Dark storage for color negatives and color slides is an easy condition to achieve since these images are exposed to light for only brief periods when they are used, and are then returned to storage. You can store color negatives and color slides in the dark by using metal containers, such as file boxes or drawers. Metal is preferred over wood or plastic because the last two kinds of materials may contain preservatives or volatile substances harmful to stored negatives or slides.

You can print color negatives many times without causing perceptible fading due to light. Use a heat-absorbing glass in the enlarger between the lamp and the negative unless your enlarger already includes a heat rejection device. Return the negatives to dark storage after use. Properly processed and stored, you can expect Kodak color negative films to give acceptable results for extended periods of time.

Color-slide films are made to be projected. The use and storage of color slides is similar to that for color negatives—slides are usually projected on a screen with a bright light for several seconds and then returned to storage.

Kodak color-slide films are remarkably stable. As previously discussed in other sections of this book, there are many photographic factors in choosing a color-slide film to use. But if longevity is the deciding factor, and if you store your slides in the dark, perhaps the best choice is KODACHROME Film. A second choice, certainly, for extended dark storage is KODAK EKTACHROME Film. EKTACHROME Films withstand the effects of light better than KODACHROME Films.

If you project your slides frequently or project them for long periods of time, it's wise to have duplicate slides made on KODAK EKTACHROME Duplicating Film 5071. Then you can project the duplicates and preserve your original slides.

Color prints are viewed in many ways—in albums, on walls, in wallets and on desks. In most cases you can have replacement prints made from the negatives or slides if the original prints fade or are damaged. If you don't have the negative or slide or if it's an instant

print, care of the print becomes very important.

Storage recommendations for color prints are the same as for color negatives and color slides. Some prints, though, are exposed to light for a much longer period of time. Whenever possible display these prints in subdued light, such as household lighting, as far from the light source as possible, and away from direct sunlight and long exposure to fluorescent lamps. Avoid temperatures above 70°F (21°C), humidities above 50 percent RH, and damaging chemicals and fumes. If you can't avoid less-than-ideal conditions, keep in mind that prints will change faster as a result. A color photographic print that is on continuous display, even under the best conditions, is likely to change in time because light, heat, humidity, and contaminants in the air are affecting the print for long periods. If you're going to display a conventional print, store the negative or slide it was made from properly so that you can have new prints made if the original print begins to fade.

A convenient way to store your prints for easy viewing and good long-term storage is to put them in photo albums. Make sure that all materials used to make the photo album are recommended for archival, or long term, storage. See the reference for standards that specifies storage materials on page 125. Of course, it's important to keep the album in rooms free of contaminants, out of direct sunlight, and where the temperature and humidity are within the recommendations specified earlier.

If your color prints were made with KODAK Instant Color Film you should use albums recommended for instant pictures. Instant print albums, such as KODAK Instant Photo Albums, let air circulate to the pictures to help them dry internally.

Freshly processed color prints made with KODAK Instant Color Film contain moisture from the processing chemicals. For the first 2 or 3 weeks keep your instant prints in a manner which will provide sufficient air circulation to allow moisture to leave the prints.

KODAK Instant Prints stored in unbound stacks on top of a table or in a drawer or file cabinet should normally receive adequate air circulation. Do not bind stacks of processed prints together with rubber bands or place them in a closed container like a box or a plastic bag that will not provide sufficient air circulation to allow the prints to dry. After this initial time period, you can store your instant prints in the same manner as conventional photographic prints. To minimize changes in the color dyes of your prints, keep them in a cool, dry place, and protect them from long exposure to bright light, high temperatures, and high humidity. For extended storage periods, follow the same temperature, humidity, and other storage conditions recommended for conventional color photographic prints.

Best Conditions for Extended Storage of Color Photographs

Storage of color photographs under normal room conditions is a practical recommendation relatively easy to achieve. You can keep color pictures under these conditions for extended periods of time, but in order to keep changes in color photographs due to fading at a minimum, you should store them in the dark under refrigeration at a temperature of 0°F (−18°C) and a relative humidity of between 30 and 35 percent.

Since refrigerators and freezers usually have high relative humidity, you should put your color negatives, color slides, or color prints into KODAK Storage Envelopes for Processed Film before refrigerating them. These envelopes, sold by photo dealers, provide moistureproof packaging for your

photographs. The envelopes are available in 4 x 5-inch and 8 x 10-inch sizes. Before putting your negatives, slides, or prints into the envelopes, condition the photographs for an hour, or, if the prints are on resin-coated paper,* for 2 days, in a room or cabinet at 70°F (21°C) or lower and 25 to 30 percent RH. The room or cabinet should be free of dust and fumes. Then insert the negatives, slides, or prints into the envelopes under these temperature and humidity conditions. Segregate the different classes of films or prints and put them in individual storage envelopes, such as color negatives in one envelope, color slides in another envelope, and instant color prints in a third envelope. Before storing color prints from KODAK Instant Color Film in KODAK Storage Envelopes, allow 6 weeks for the prints to dry completely internally after processing.

Seal the envelopes according to the instructions that come with the envelopes. If your color prints are larger than 8 x 10 inches, you can protect them from moisture by using three wraps of aluminum foil and sealing the folds and seams with moisture-proof tape.

If you store several negatives, slides, or prints in the same envelope, separate them with sheets of paper. Be sure that the paper is of archival quality free of harmful chemicals. See the standards reference for storage materials on page 125.

With refrigerated storage there is the possibility of a power failure so you may want to have an alarm signal installed by an electrician for your refrigerator or freezer in order to alert you if a power outage occurs. The humidity rises rapidly to high levels in refrigerators or freezers when the power fails. This could damage photographs stored under refrigeration if they are not protected from high humidity.

Power failures with a refrigerator should not cause a humidity problem when color photographs are sealed in KODAK Storage Envelopes. The humidity inside the envelopes is established at the time of sealing and remains stable as long as the seal is not broken. A power failure with a freezer is more serious because of the possibility of puddles of water forming from melting ice and frost on the freezer compartment walls. In this situation remove the storage envelopes from the freezer until power is restored. When the storage envelopes are in the freezer for cold storage, it's a good idea to place them in an elevated position to avoid any moisture that could form on the bottom of the freezer.

Such elaborate care is needed only for color photographs that you want to store for a very long time.

An alternative for long-term storage of color photographs is to have three color-separation negatives of the color image made on black-and-white film. Since these separation negatives have silver images, you can expect the negatives to last as long as other properly processed black-and-white negatives stored under the best conditions. You can have color images made from the separation negatives any time in the future. Custom processing laboratories do this type of work. The process, though, is expensive and requires skilled photographic work.

For a more thorough discussion of long-term keeping of photographs, see your photo dealer for the KODAK Publications, *Storage and Care of KODAK Color Materials*, E-30, and *Preservation of Photographs*, F-30. Or you can obtain single copies of E-30 from the address given on page 52. You can purchase copies of F-30 as explained on the inside back cover.

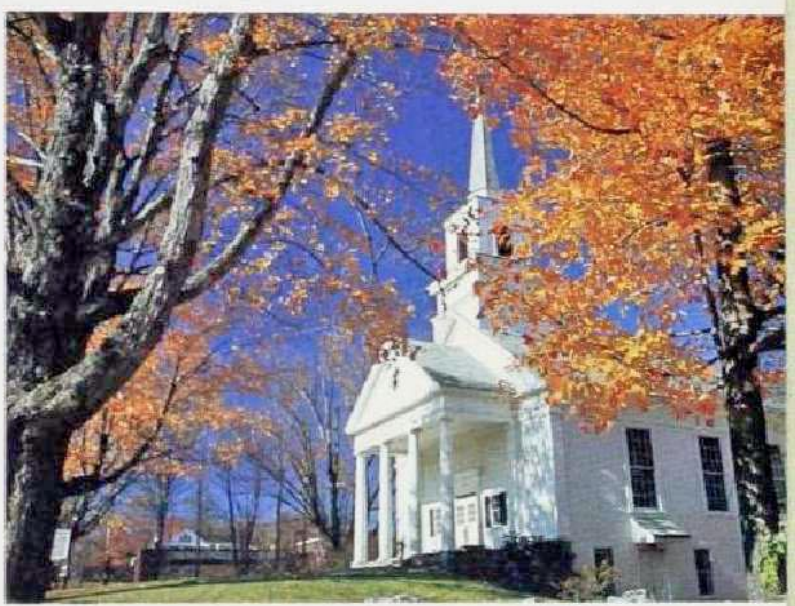
*You can determine if your prints were made on resin-coated paper by the smooth, plastic-like surface on the back of the prints.

Protection from Physical Damage. Keep slides and negatives as clean and dustfree as possible. A good rule is never to touch the film with your fingers, except by the edges. The best way to protect negatives is to store them in envelopes with side seams. The paper or plastic and adhesive should meet the requirements of American National Standard PH1.53-1978, *Requirements for Photographic Filing Enclosures for Storing Processed Photographic Films, Plates, and Papers*. Other ANSI publications that you might find helpful are PH1.43-1981, *Practice for Storage of Processed Safety Photographic Film* and PH1.48-1974, *Practice for Storage of Black-and-White Photographic Paper Prints*. You can purchase AN Standards from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018. Stores that sell photo products usually offer a variety of containers for storing 2 x 2-inch slides.

Don't store color negatives or slides near moth-preventive chemicals, which tend to crystalize on the films and damage the adhesive used in slide mounts. Exposure to nitrogen oxides, hydrogen sulfide, or sulfur dioxide gas may cause slow fading of color dyes. The solvents and chemicals used in insecticides and fungicide sprays may be harmful to processed films and slide mounts. Keep films away from chemical dust; alkaline dust particles and hypo particles on the emulsion may cause dye fading after a prolonged storage period. Protect your film from insects, because some species will eat the gelatin emulsion and possibly the film base, too.

CARE IN PROJECTION OF SLIDES

You can use slides that are properly cared for for many years. However, the light and heat that result from prolonged projection with high-wattage lamps will shorten the life and may even distort the slides. Avoid projection times longer than 1 minute. Never remove the heat-absorbing glass or use a lamp of higher wattage than recommended for the projector. Don't obstruct the air intake or outlet for cooling the projector.



HERB JONES

Binding slides in glass will protect them from physical damage such as dirt and scratches. When you use glass-mounted slides in high-wattage projectors, moisture may condense on the inside of the glass. You can usually eliminate the moisture by storing slides with activated silica gel.

HOW TO SAVE WATER-SOAKED FILMS

Water from floods, fire-fighting, burst pipes, and leaky roofs can cause serious damage to stored negatives and slides. You can keep the damage to a minimum when you act quickly to salvage the films.

The first thing to remember is to keep the water-soaked negatives and slides and their enclosures, such as slide mounts, envelopes, and sleeves, wet. Do

JOSEPH F. SCHULTE

Existing light plus bounce flash

not allow them to dry. Immerse them completely in plastic containers of cold water below 65°F (18°C), containing about 15 mL of 37 percent formaldehyde solution (by weight) per litre of water. The cold water and the formaldehyde will help prevent swelling and softening of the gelatin emulsion which are the major causes of damage and the growth of bacteria. When handling chemicals, be sure to observe and follow the precautionary information printed on the chemical containers.

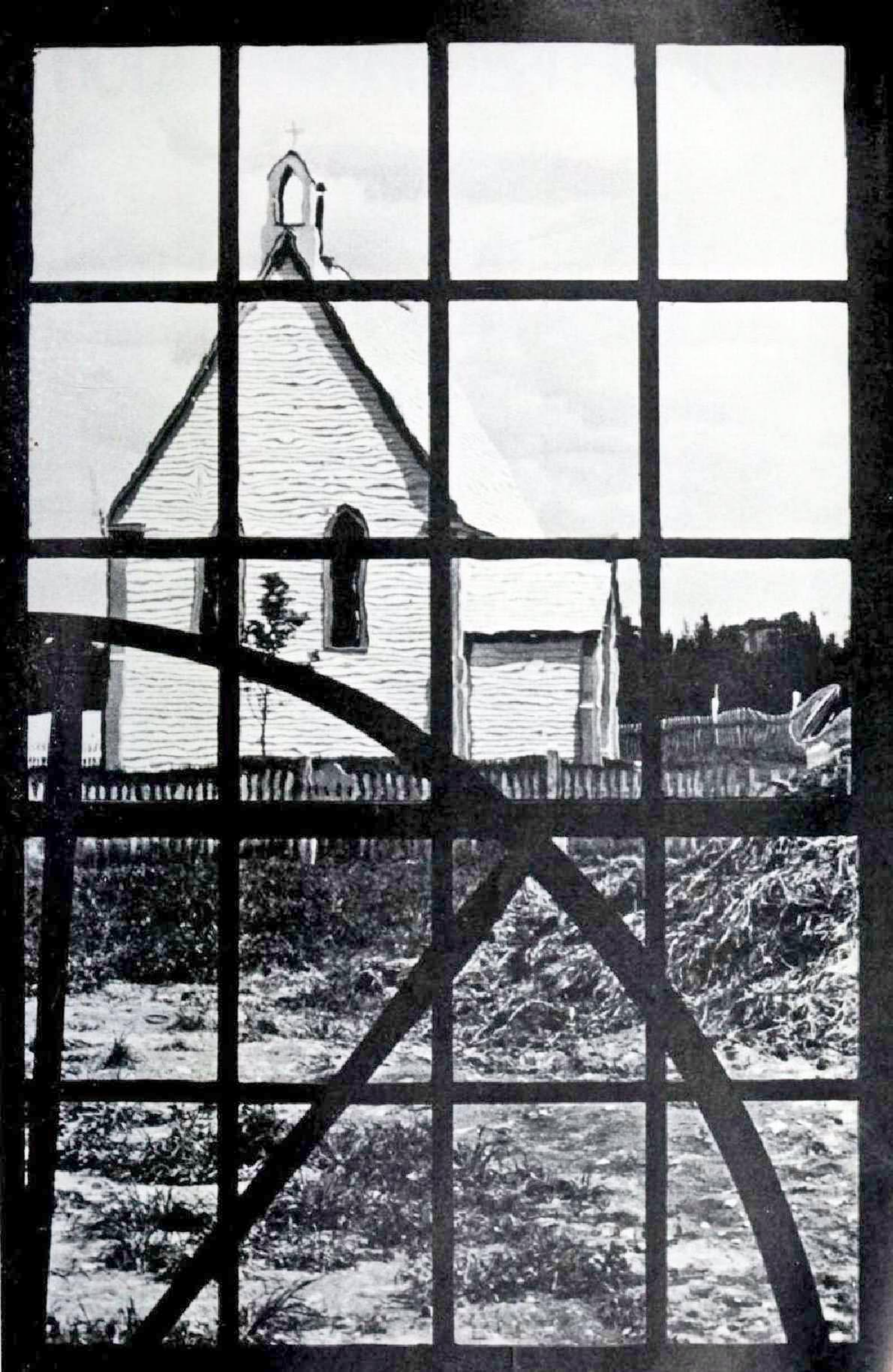
As soon as possible, carefully separate the negatives and slides from their enclosures and wash the films for 10 to 15 minutes in water at 65°F (18°C) or lower. If necessary, you can clean the films by swabbing them with a tuft of cotton *under water*. Use extreme care because the wet emulsion is very susceptible to physical damage. Avoid any sudden temperature changes in the wash water. If you're trying to salvage color slides or color negatives, treat them in a stabilizer bath before drying if one was used for their original processing. Consult the instructions that come with the color processing chemicals for use of a stabilizer. Rinse negatives and slides for 1 minute in diluted KODAK PHOTO-FLO Solution before drying.

These recommendations do not apply to KODAK Instant Color Film.

For exposed water-soaked film that has not been processed, keep it wet and process it as soon as possible.

PLUS-X Pan Film

R. E. BALCH, KINSA



KODAK COLOR FILMS FOR STILL CAMERAS

KODAK Film	Type of Pictures	For Use with	ISO (ASA) Film Speed and Filter			Film Code Numbers and Sizes Available	Processed by	Process
			Daylight	Photolamps 3400 K	Tungsten 3200 K			
KODACOLOR II (C)	Color Prints	Daylight, Electronic Flash, Blue Flash, or Existing Light	**100**	**32** No. 80B	**25** No. 80A	5035—sizes 135-12, 135-24, 135-36, 828, 110-12, 110-24, 126-12, 126-24 6014—sizes 120, 127, 620, 616, 116	Kodak, other labs, or users	C-41
KODACOLOR 400 (CG)	Color Prints		**400**	**125** No. 80B	**100** No. 80A	5075—sizes 135-12, 135-24, 135-36, 110-12, 110-24 6075—size 120	Kodak, other labs, or users	C-41
Instant Color Film (PR)	Instant Color Prints	Daylight, Electronic Flash, Blue Flash, or Existing Daylight	Exposure Index **160**	**50** No. 80B	**40** No. 80A	7870—size 144-10	Users	Instant
KODACHROME 25 (Daylight) (KM)	Color Slides	Daylight, Electronic Flash, or Blue Flash	**25**	**8** No. 80B	**6** No. 80A	5073—size 135-20, 135-36	Kodak and other labs	Commercial Laboratory K-14
KODACHROME 64 (Daylight) (KR)	Color Slides		**64**	**20** No. 80B	**16** No. 80A	5032—sizes 135-20, 135-36, 110-20, 126-20	Kodak and other labs	Commercial Laboratory K-14
KODACHROME 40 5070 (Type A) (KPA)	Color Slides	Photolamps 3400 K	**25** No. 85	**40**	**32** No. 82A	5070—size 135-36	Kodak and other labs	Commercial Laboratory K-14
EKTACHROME 64 (Daylight) (ER)*	Color Slides	Daylight, Electronic Flash, or Blue Flash	**64**	**20** No. 80B	**16** No. 80A	5031—sizes 135-20, 135-36, 110-20, 126-20 6031—size 127	Kodak, other labs, or users	E-6
EKTACHROME 200 (Daylight) (ED)*	Color Slides	Daylight, Electronic Flash, Blue Flash, or Existing Daylight	**200**	**64** No. 80B	**50** No. 80A	5076—sizes 135-20, 135-36, 126-20	Kodak, other labs, or users	E-6
			400†	**125**† No. 80B	**100**† No. 80A			
EKTACHROME 400 (Daylight) (EL)	Color Slides		**400**	**125** No. 80B	**100** No. 80A	5074—size 135-20, 135-36 6074—size 120	Kodak, other labs, or users	E-6
			800†	**250**† No. 80B	**200**† No. 80A			
EKTACHROME 160 (Tungsten) (ET)*	Color Slides	Tungsten Lamps 3200 K or Existing Tungsten Light	**100** No. 85B	**125** No. 81A	**160**	5077—size 135-20, 135-36	Kodak, other labs, or users	E-6
			200† No. 85B	**250**† No. 81A	**320**†			

EKTACHROME Infrared (IE)	Color Slides	Daylight, Electronic Flash, or Blue Flash	**100** No. 12 or 15	**50** No. 12 or 15 + CC50C-2	—	2236—size 135-20*	Kodak, other labs, or users	E-4
EKTACHROME Slide Duplicating 5071	Color Slides	Tungsten Lamps 3200 K or Daylight‡	**12**‡	—	**12**‡	5071—size 135-36	Kodak, other labs, or users	E-6
EKTACHROME SE Duplicating SO-366	Color Slides	Electronic Flash or Daylight‡	**16**‡	—	—	SO-366—size 135-36	Kodak, other labs, or users	E-6

Note: See page D 1 for an explanation of the code letters after each film name.

*Size 120 rolls are available in the professional versions of these KODAK EKTACHROME Films. See page 40.

†With KODAK EKTACHROME 400, 200, and 160 Films, 135 and 120 sizes, and ESP-1 Processing. See page 54.

‡See Data Sheet pages D 24 and D 25 for exposure and filter information.

KODAK BLACK-AND-WHITE FILMS FOR STILL CAMERAS

KODAK Film	Film Speed	Definition				Film Code Numbers and Sizes Available
		Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential§	
VERICHROME Pan (VP)	ISO (ASA) 125	Extremely Fine	High	Very High	High	7042—size 110-12 8041—size 126-12 6041—sizes 120, 127, 620
PLUS-X Pan (PX)	ISO (ASA) 125	Extremely Fine	High	Very High	High	5062—size 135-20, 135-36
PANATOMIC-X (FX)¶ PANATOMIC-X Professional (FXP)	ISO (ASA) 32	Extremely Fine	Very High	Very High	Very High	5060—size 135-20, 135-36 6040—size 120
TRI-X Pan (TX)	ISO (ASA) 400	Fine	High	Very High	Moderate	5063—size 135-20, 135-36 6043—size 120
ROYAL-X Pan (RX)	ISO (ASA) 1250	Medium	High	High	Moderately Low	6046—size 120
Recording 2475 (RE)	1000	Coarse	Medium	Very High	Low	2475—size 135-36
High Speed Infrared (HIE)	125** No. 25 Filter	Fine	Medium	Medium	Moderately Low	2481—size 135-20
Technical Pan 2415 (TP)	320††	Extremely Fine	Extremely High	Extremely High	Extremely High	2415—size 135-36

§For good-quality negatives.

¶With special reversal processing, PANATOMIC-X Film in 135 size will produce black-and-white positive slides. See page D 31 for film speeds.

**Speed for tungsten light.

††Speed for copying with tungsten light. See Data Sheet page D 40.

Data Sheets

KODAK Films for General Use

The following Data Sheets provide detailed information to help you obtain the best possible results with each film. Since recommendations may change, whenever these Data Sheets do not agree with the instructions included with the film, follow the film instructions. The instructions in the film package are updated more frequently.

The film code letter designation and the film code number for each film are given on the Data Sheets. The code letter designation is printed on the film carton, on 135 magazines, 110 and 126 cartridges, and rolls to help identify the kind of film. For example, KODACHROME 64 Film (Daylight) is identified by the letters "KR." This film in 135 size with 20 exposures, is identified as KR135-20.

The film code number is printed on the actual film itself for most sizes so that you can identify the film after it's processed, if necessary. The film code number for KODACHROME 64 Film (Daylight) is 5032, for example.

COLOR FILMS

	Page
KODACOLOR II Film	D 2
KODACOLOR 400 Film	D 4
KODAK Instant Color Film	D 6
KODACHROME 25 Film (Daylight)	D 8
KODACHROME 64 Film (Daylight)	D 10
KODACHROME 40 Film 5070 (Type A)	D 12
KODAK EKTACHROME 64 Film (Daylight)	D 14
KODAK EKTACHROME 200 Film (Daylight)	D 16
KODAK EKTACHROME 400 Film (Daylight)	D 18
KODAK EKTACHROME 160 Film (Tungsten)	D 20
KODAK EKTACHROME Infrared Film 2236	D 22
KODAK EKTACHROME Slide Duplicating Film 5071 (Process E-6) and KODAK EKTACHROME SE Duplicating Film, SO-366 (Process E-6)	D 24

BLACK-AND-WHITE FILMS

KODAK VERICHROME Pan Film	D 26
KODAK PLUS-X Pan Film	D 28
KODAK PANATOMIC-X Film and KODAK PANATOMIC-X Professional Film	D 30
KODAK TRI-X Pan Film	D 32
KODAK ROYAL-X Pan Film	D 34
KODAK Recording Film 2475	D 36
KODAK High Speed Infrared Film 2481	D 38
KODAK Technical Pan Film 2415	D 40
Reciprocity Characteristics for KODAK Black-and-White Films for General Use	D 41
Selecting a KODAK Developer for Black-and-White Film	D 42

KODACOLOR 400 Film, 1/250 sec *f*/11
JEANNETTE KLUTE

For Color Prints

A general-purpose, color-negative film with high sharpness, extremely fine grain, and superb color rendition. The film's fast speed of ISO (ASA) 100 is just right for most picture-taking situations. You can take pictures with this film by daylight, electronic flash, or blue flashbulbs. KODACOLOR II Film is noted for its wide exposure latitude, which minimizes the effects of exposure errors. This film is designed for producing color prints, but color slides and black-and-white prints can also be made from the negatives.

Sizes Available: 135-12 exposures, 135-24 exposures, 135-36 exposures; 110-12 exposures, 110-24 exposures; 126-12 exposures, 126-24 exposures; 120; 127; 620; 828; 616; 116.

Film Code Letter Designation: C.

Film Code Numbers: 5035—sizes 135, 110, 126, 828; 6014—sizes 120, 127, 620, 616, 116.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
DAYLIGHT	**ISO (ASA) 100**	**None**
PHOTOLAMPS 3400 K	ISO (ASA) 32	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 25	No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure Table: For average subjects.

Shutter Speed 1/125 Second					
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/11*	*f*/8	*f*/5.6	*f*/4	*f*/4

*For frontlighted subjects. For backlighted close-up subjects use *f*/5.6 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number*	40	50	60	70	85	100	120	140	170	200

*If your prints are consistently too blue, use a No. 81B filter and increase your exposure by ⅓ stop.

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flash-cube	HI-POWER Flash-Cube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	90	130	65	85	90	120	130	130	NR	180	NR
M	1/30	60	85	45	NR	65	NR	90	120	130	170	180
	1/60	60	85	45	NR	65	NR	90	110	90	160	130
	1/125	50	70	38	NR	55	NR	75	90	60	130	85
	1/250	38	55	32	NR	45	NR	65	75	42	110	60
	1/500	32	45	24	NR	34	NR	50	55	30	80	44

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment required when a filter is indicated.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	+½ stop CC10C	+½ stop CC15C	+1½ stops CC30C	+1½ stops CC30C

PROCESSING

You can have your film developed and printed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order enlargements or color slides from your negatives.

You can develop KODACOLOR II Film in your own darkroom and print the negatives on KODAK EKTACOLOR 74 RC Paper, EKTACOLOR 78 Paper, or EKTAFLEX PCT Negative Film and EKTAFLEX PCT Paper. Process the film in the KODAK* FLEXICOLOR Processing Kit, Process C-41, or equivalent, available from photo dealers. If you want black-and-white prints from your color negatives, you can use KODAK PANALURE Paper. Instructions are included with the papers and with the processing kit.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Extremely Fine	High	High	High

*For good-quality negatives.

For Color Prints

An exceptionally fast color-negative film for photographing dimly lighted subjects, such as those in existing light; fast action; and subjects that require good depth of field and high shutter speeds; and for extending the flash distance range. This is Kodak's fastest film for color prints—ISO (ASA) 400. The film is color-balanced for daylight, electronic flash, or blue flash. It also has special sensitizing characteristics that give you pleasing pictures exposed with other light sources, such as household light bulbs and fluorescent lamps, without using filters on your camera. KODACOLOR 400 Film has considerable versatility. You can use it to photograph subjects ranging from bright sunlight to very dim light, depending on your camera. In addition, the film offers wide exposure latitude.

Sizes Available: 135-12 exposures, 135-24 exposures, 135-36 exposures; 110-12 exposures, 110-24 exposures; 120.

Film Code Letter Designation: CG.

Film Code Numbers: 5075—sizes 135, 110; 6075—size 120.

EXPOSURE

Speeds and Filter Recommendations for Critical Use:

Type of Light	Film Speed	Filter
DAYLIGHT	**ISO (ASA) 400**	**None**
PHOTOLAMPS 3400 K	ISO (ASA) 125	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 100	No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure Table: For average subjects.

Shutter Speed 1/500 Second	Shutter Speed 1/250 Second				
Bright or Hazy Sun Distinct Shadows	Bright or Hazy Sun Distinct Shadows	Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/16*	*f*/11	*f*/8	*f*/5.6	*f*/5.6

*For frontlighted subjects. For backlighted close-up subjects use *f*/8 at 1/250 second.
†Subject shaded from the sun but lighted by a large area of sky.

Existing-Light Exposure Table:

Use an exposure meter or a camera with built-in meter if you have one. For cameras without exposure meters or for scenes that are difficult to meter, try the settings suggested in the table. These exposures are *guides*; for more assurance, bracket your exposures 1 stop on each side of the suggested exposure.

Picture Subject	Shutter Speed	Lens Opening
Home Interiors at Night—		
Areas with bright light	1/30	*f*/2.8
Areas with average light	1/30	*f*/2
Candlelighted Close-ups	1/15*	*f*/2
Interiors with Bright Fluorescent Light	1/60	*f*/4
Indoor, Outdoor Christmas Lighting at Night	1/15*	*f*/2
Brightly Lighted Downtown Street Scenes at Night	1/60	*f*/2.8
Brightly Lighted Theatre Districts—Las Vegas or Times Square	1/60	*f*/4
Neon Signs, Other Lighted Signs	1/125	*f*/4
Store Windows at Night	1/60	*f*/4
Floodlighted Buildings, Fountains, Monuments	1/15*	*f*/2
Distant View of City Skyline at Night	1*	*f*/2.8
Skylines—10 minutes after sunset	1/60	*f*/5.6

Picture Subject	Shutter Speed	Lens Opening
Fairs, Amusement Parks	1/30	*f*/2.8
Aerial Fireworks Displays—		
Keep camera shutter open on BULB for several bursts	BULB*	*f*/16
Night Football, Baseball, Racetracks	1/125	*f*/2.8
Basketball, Hockey, Bowling	1/125	*f*/2
Boxing, Wrestling	1/250	*f*/2
Stage Shows—		
Average lighting	1/60	*f*/2.8
Bright lighting	1/125	*f*/4
Circuses—Floodlighted acts	1/60	*f*/2.8
Ice Shows—Floodlighted acts	1/125	*f*/2.8
Ice Shows, Circuses—Spotlighted acts (carbon arc)	1/250	*f*/2.8
School—Stage and auditorium	1/30	*f*/2
Swimming Pool—Indoors, tungsten lights above water	1/60	*f*/2
Church Interiors—Tungsten lights	1/30	*f*/2

*Use a tripod or other firm camera support.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	85	100	120	140	170	200	240	280	340	400

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	HI-POWER Flashcube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	180	260	130	170	180	240	260	260	NR	360	NR
M	1/30	120	170	90	NR	130	NR	180	240	260	340	360
	1/60	120	170	90	NR	130	NR	180	220	180	320	260
	1/125	100	140	75	NR	110	NR	150	180	120	260	170
	1/250	75	110	65	NR	90	NR	130	150	85	220	120
	1/500	65	90	50	NR	70	NR	100	110	60	160	85

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment required when a filter is indicated.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+½ stop No Filter	+1½ stops CC10M	+2 stops CC10M

PROCESSING

You can have your film developed and printed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order enlargements or color slides from your negatives.

You can develop KODACOLOR 400 Film in your own darkroom and print the negatives on KODAK EKTACOLOR 74 RC Paper, EKTACOLOR 78 Paper, or EKTAFLEX PCT Negative Film and EKTAFLEX PCT Paper. Process the film in the KODAK FLEXICOLOR Processing Kit, Process C-41, or equivalent, available from photo dealers. If you want black-and-white prints from your color negatives, you can use KODAK PANALURE Paper. Instructions are included with the papers and with the processing kit.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Very Fine	Medium	Medium	Moderately Low

*For good-quality negatives.

For Color Prints

KODAK Instant Color Film is designed for use in KODAK Instant Cameras and Instant Film Backs. This film produces color prints directly from the camera which develop in a matter of minutes. You don't have to time development or peel off any components. The film is litter-free except for packaging materials, the empty film pack, and the film cover. KODAK Instant Prints have a KODAK SATINLUXE® Finish and excellent grain and sharpness characteristics. This surface, which is hard and dry from the moment the prints are ejected, lets you handle prints without fingerprinting and with a minimum of scratching. The film is color balanced for daylight, blue flash, and electronic flash.

Size Available: 144-10 exposures.

Film Code Letter Designation: PR.

Film Code Number: 7870.

Picture Size: The overall print size, including the white borders, is $3\frac{13}{16}$ x 4 inches (9.7 x 10.2 cm). The actual image size within the borders is $2\frac{5}{8}$ x $3\frac{9}{16}$ inches (6.8 x 9.1 cm).

Camera Loading: Before loading your camera, check to see that the rollers are clean. If the rollers need cleaning, follow the instructions in your camera manual. Whenever possible, avoid loading the film pack in direct sunlight. Hold the film pack by the edges only! When you remove the protective wrapping, be careful not to squeeze the pack or apply pressure to the film cover, since this could allow light to spoil your pictures.

EXPOSURE

Speeds and Filter Recommendations for Adjustable Cameras:

Type of Light	Film Speed		Filter
	Temperature	Exposure Index	
DAYLIGHT	60° F (16° C) **72.5° F (22.5° C)** 95° F (35° C)	160 **160** 125	None
PHOTOLAMPS 3400 K	Exposure Index 50		No. 80B
TUNGSTEN 3200 K	Exposure Index 40		No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Lighten/Darken Control for Automatic Cameras: Under most conditions, you will want to take pictures with the Lighten/Darken control on your camera in the center position. However, the lightness or darkness of your prints can be affected by such factors as temperature and type and brightness of subject. The Lighten/Darken control helps you to compensate for these effects. After taking a picture, if you want to take a lighter or darker picture of the same subject in the same location without changing the lighting or your position, adjust the Lighten/Darken control *before* taking the next picture. To take a lighter picture, move the control toward Lighten; for a darker picture, move the control toward Darken.

If you take flash pictures of subjects outside the recommended flash distance range, subjects closer than the minimum distance will probably be too light and unsharp; subjects farther than the maximum distance will probably be too dark, regardless of the Lighten/Darken control setting.

Flash for Automatic Cameras: Use blue flash or electronic flash. See your camera and electronic flash manuals for detailed information on flash.

Electronic Flash Guide Numbers for Adjustable Cameras: Use the table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	55	65	75	90	110	130	150	180	210	250

Reciprocity Characteristics for Adjustable Cameras: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment required when a filter is indicated.

Exposure Time in Seconds				
1/100	1/10	1	10	100
None No Filter	+⅓ stop CC05Y	+1 stop CC20Y	+2⅔ stops CC30Y	+4 stops CC30Y

DEVELOPMENT

Pictures begin to develop as they are ejected from the camera. Hold the prints by their borders, and don't bend, flex, or attempt to fold them. Never leave prints in direct sunlight or on hot surfaces during development.

An image will begin to appear in about 30 seconds under normal room temperature conditions, 72°F (22°C). Do not attempt to make a judgment of print appearance until development is sufficiently advanced. You can judge expression and composition in about 90 seconds and exposure usually after 2 or 3 minutes under normal temperature conditions. Development is essentially complete after about 5 minutes at this temperature. Development will be slower at cooler temperatures and faster at warmer temperatures. Prints will appear lighter when judged in direct sunlight than they will under normal room lighting.

Temperature Effects on Prints: The recommended temperature range during development of prints is 60 to 100°F (16 to 38°C). At temperatures below 60°F (16°C), place your prints in a warm place—an inside pocket, for example—as soon as they are ejected from the camera, and leave them there during development. Otherwise, your prints may appear too light. It may be desirable at the upper end of the temperature range—approaching 100°F (38°C)—to set the Lighten/Darken control toward Lighten to keep prints from becoming too dark.

STORAGE AND CARE OF FILM AND PRINTS

Avoid storing the camera and film in a hot place such as the glove compartment or rear-window shelf of a car in the sun because this may result in reduced picture quality and a permanently damaged camera. If you inadvertently leave the camera and film in a hot place, allow them to cool for at least one hour before taking any pictures. Also, allow them to return to normal temperature if they have been left in a cold place.

Store your prints in a cool, dry place. Color dyes may change over a period of time. Print colors will remain unchanged longer if you protect your pictures from long exposure to bright light.

You can use a soft-tip pen or marker with permanent, waterproof ink to write on the white borders of the prints. You may want to write the date, location, or special event on the print border, for example. KODAK Instant Marking Pens are sold by photo dealers. The pen's ink is black, fast-drying, and adheres to nonporous surfaces without smearing.

Each picture is a sealed unit that contains a caustic fluid. Never cut, trim, puncture, tear, or separate the picture unit, since this may allow some of the fluid to escape and come into contact with skin or eyes.

CAUTION: Picture units in the film pack contain a caustic fluid. Upon ejection from the camera, the fluid in the picture unit begins to neutralize, and in approximately 10 minutes any chance of harm is minimal. Should any fluid escape from the picture unit, avoid contact with eyes, mouth, and skin. Also avoid fluid contact with fabrics, carpeting, and furniture to prevent stain.

In case of contact with eyes, immediately flush with plenty of water and get medical attention. In case of any other contact, wash thoroughly at once.

The empty film pack has sharp internal edges. Discard out of the reach of children.

ADDITIONAL PRINTS AND SLIDES

You can have additional color prints and color enlargements made from your original instant color prints. When made by a Kodak Processing Laboratory, the prints are called KODAK Color Copyprints; the enlargements, KODAK Color Copy Enlargements.

You can also have color slides made from your color prints. When Kodak makes these slides, they are called KODAK Color Copy Slides.

For Color Slides

A favorite for color slides because of its excellent color quality, extremely high sharpness, and extremely fine grain. This film is great for bright lighting conditions where you want the best possible image quality. The film retains good detail in both highlights and shadow areas. Its speed is adequate for many picture-taking situations and it has good exposure latitude. It therefore produces acceptable results even with moderate overexposure or underexposure. This film is designed for use in daylight, or with electronic flash or blue flashbulbs.

Size Available: 135-20 exposures, 135-36 exposures.

Film Code Letter Designation: KM.

Film Code Number: 5073.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
DAYLIGHT	**ISO (ASA) 25**	**None**
PHOTOLAMPS 3400 K	ISO (ASA) 8	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 6	No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure Table: For average subjects.

Shutter Speed 1/125 Second				Shutter Speed 1/60 Second	
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/11	*f*/8*	*f*/5.6	*f*/4	*f*/4	*f*/4

*For frontlighted subjects. For backlighted close-up subjects use *f*/4 at 1/125 second.

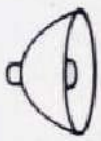
†Subject shaded from the sun but lighted by a large area of sky.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number*	20	24	30	35	40	50	60	70	85	100

*If your slides are consistently too blue, use a No. 81B filter and increase your exposure by ⅓ stop.

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
												
		Flash-cube	Hi-POWER Flash-Cube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	45	65	32	42	45	60	65	65	NR	90	NR
M	1/30	30	42	22	NR	32	NR	45	60	65	85	90
	1/60	30	42	22	NR	32	NR	45	55	45	80	65
	1/125	26	36	20	NR	28	NR	38	45	30	65	42
	1/250	20	28	16	NR	22	NR	32	38	22	55	30
	1/500	16	24	12	NR	18	NR	24	28	15	40	22

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment required when a filter is indicated.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+½ stop No Filter	+2 stops CC10B	+3 stops CC20B

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

You can't process KODACHROME Films successfully in your own darkroom because the process is highly complex and requires commercial photofinishing equipment.

DEFINITION

Graininess	Resolving Power	Sharpness
Extremely Fine	High	Extremely High

For Color Slides

A medium-speed, color-slide film for general picture-taking. The ISO (ASA) 64 speed makes the film a good choice for making color slides when lighting conditions are less than ideal. Under normal lighting conditions, you can use high shutter speeds or small lens openings. KODACHROME 64 Film exhibits remarkable sharpness and freedom from graininess. Color rendition is excellent—colors are crisp and saturated. The film is for use with daylight, electronic flash, or blue flashbulbs.

Sizes Available: 135-20 exposures, 135-36 exposures; 110-20 exposures; 126-20 exposures.

Film Code Letter Designation: KR.

Film Code Number: 5032.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
DAYLIGHT	**ISO (ASA) 64**	**None**
PHOTOLAMPS 3400 K	ISO (ASA) 20	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 16	No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure Table: For average subjects.

Shutter Speed 1/125 Second					
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/11*	*f*/8	*f*/5.6	*f*/4	*f*/4

*For frontlighted subjects. For backlighted close-up subjects use *f*/5.6 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number*	32	40	45	55	65	80	95	110	130	160

*If your slides are consistently too blue, use a No. 81B filter and increase your exposure by ⅓ stop.

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flash-cube	Hi-POWER Flash Cube	AG-1B	M 2 B	AG-1B	M 2 B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	70	100	50	70	75	100	100	100	NR	150	NR
M	1/30	50	70	36	NR	50	NR	75	90	100	130	140
	1/60	50	65	36	NR	50	NR	70	90	75	130	100
	1/125	40	55	30	NR	45	NR	60	75	50	110	70
	1/250	30	45	26	NR	36	NR	50	60	34	85	50
	1/500	26	36	20	NR	28	NR	40	45	24	65	34

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment required when a filter is indicated.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+1 stop CC10R	NR	NR

NR—Not Recommended.

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

You can't process KODACHROME Films successfully in your own darkroom because the process is highly complex and requires commercial photofinishing equipment.

DEFINITION

Graininess	Resolving Power	Sharpness
Extremely Fine	High	Extremely High

For Color Slides

KODACHROME 40 Film is for use with 3400 K photolamps. It has extremely fine grain, extremely high sharpness, and superior color quality. It has exceptional definition for which KODACHROME Films are noted. Its speed is sufficient for photolamp illumination. KODACHROME 40 Film is excellent for informal portraits, close-ups, title slides, and for copying color originals. You can also take pictures in daylight or with electronic flash or blue flash with this film by using a No. 85 filter over your camera lens.

Size Available: 135-36 exposures.

Film Code Letter Designation: KPA.

Film Code Number: 5070.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
PHOTOLAMPS 3400 K	**ISO (ASA) 40**	**None**
TUNGSTEN 3200 K	ISO (ASA) 32	No. 82A
DAYLIGHT	ISO (ASA) 25	No. 85

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Photolamps—3400 K: The following table is based on the use of two 500-watt reflector-type photolamps 3400 K, such as General Electric DXC and Sylvania DXC reflector floodlamps. Use one as a fill-in light close to the camera at lens level; the other as the main light on the opposite side of the camera, 2 to 4 feet (0.6 to 1.2 metres) higher, and at a 45-degree angle from the camera-subject axis. Position both lights the same distance from the subject.

EXPOSURE TABLE FOR 500-WATT REFLECTOR-TYPE PHOTOLAMPS 3400 K			
Set Shutter Speed at 1/60 Second			
Lamp-to-Subject Distance	4½ ft (1.4 m)	6 ft (1.8 m)	9 ft (2.7 m)
Lens Opening	*f*/4	*f*/2.8	*f*/2

NOTE: Use these camera settings as guides only. The lamp-to-subject distances give a lighting ratio of 2:1. For a 3:1 ratio, place the fill-in light at a distance from the subject 1.4 times the distance for the main light and use a lens opening ½ stop larger.

This table is based on the use of new lamps. After the lamps have burned for 1 hour, use a lens opening ½ stop larger; after 2 hours, use a lens opening 1 stop larger.

Daylight Exposure Table: For average subjects. *Use a No. 85 filter.*

Shutter Speed 1/125 Second				Shutter Speed 1/60 Second	
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/11	*f*/8*	*f*/5.6	*f*/4	*f*/4	*f*/4

*For frontlighted subjects. For backlighted close-up subjects use *f*/4 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Electronic Flash Guide Numbers: *Use a No. 85 filter.* This table is intended as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	20	24	30	35	40	50	60	70	85	100

Flash Guide Numbers: *Use blue flashbulbs or flashcubes and a No. 85 filter.** Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	HI-POWER Flashcube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B†	M3B 5B 25B	26B†
X	1/30	45	65	32	42	45	60	65	65	NR	90	NR
M	1/30	30	42	22	NR	32	NR	45	60	65	85	90
	1/60	30	42	22	NR	32	NR	45	55	45	80	65
	1/125	26	36	20	NR	28	NR	38	45	30	65	42
	1/250	20	28	16	NR	22	NR	32	38	22	55	30
	1/500	16	24	12	NR	18	NR	24	28	15	40	22

*If you prefer, you can use clear flashbulbs. Multiply the guide numbers in the table by 1.4, and use a No. 81EF filter with AG-1 and M3 flashbulbs or a No. 81C filter with other clear flashbulbs.

†Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure compensation for different exposure times.

Exposure Time in Seconds							
1/10,000	1/1000	1/100	1/10	1	5	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+½ stop No Filter	+1 stop No Filter	NR	NR

NR—Not Recommended.

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

You can't process KODACHROME Films successfully in your own darkroom because the process is highly complex and requires commercial photofinishing equipment.

DEFINITION

Graininess	Resolving Power	Sharpness
Extremely Fine	High	Extremely High

For Color Slides

An excellent film for general picture-taking when you want color slides. EKTACHROME 64 Film produces vivid colors, clean highlights, and good shadow detail. It has very high sharpness and low graininess which gives very good image quality. The medium speed of the film helps you to take high-quality pictures in the shade or on overcast days. It's balanced for daylight; for flash pictures, use electronic flash or blue flashbulbs. A feature of this film, as with all KODAK EKTACHROME Films, is that you can process it in your own darkroom if you want to.

Sizes Available: 135-20 exposures, 135-36 exposures; 110-20 exposures; 126-20 exposures; 127.

Film Code Letter Designation: ER.

Film Code Numbers: 5031—sizes 135, 110, 126; 6031—size 127.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
DAYLIGHT	**ISO (ASA) 64**	**None**
PHOTOLAMPS 3400 K	ISO (ASA) 20	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 16	No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure Table: For average subjects.

Shutter Speed 1/125 Second					
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/11*	*f*/8	*f*/5.6	*f*/4	*f*/4

*For frontlighted subjects. For backlighted close-up subjects use *f*/5.6 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number*	32	40	45	55	65	80	95	110	130	160

*If your slides are consistently too blue, use a No. 81B filter and increase your exposure by ⅓ stop.

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	HI-POWER Flash Cube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	70	100	50	70	75	100	100	100	NR	150	NR
M	1/30	50	70	36	NR	50	NR	75	90	100	130	140
	1/60	50	65	36	NR	50	NR	70	90	75	130	100
	1/125	40	55	30	NR	45	NR	60	75	50	110	70
	1/250	30	45	26	NR	36	NR	50	60	34	85	50
	1/500	26	36	20	NR	28	NR	40	45	24	65	34

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure compensation for different exposure times.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+½ stop No Filter	+1 stop No Filter	NR

NR—Not Recommended.

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

To process the film yourself, use the KODAK EKTACHROME Film Processing Kit, Process E-6, or equivalent, sold by photo dealers.

DEFINITION

Graininess	Resolving Power	Sharpness
Very Fine	High	Very High

KODAK EKTACHROME 200 Film (Daylight)

For Color Slides

A high-speed color-slide film for photographing dimly lighted subjects, fast action, subjects that require good depth of field and high shutter speeds, and for extending the distance range for flash pictures. EKTACHROME 200 Film combines high speed with excellent definition characteristics—very fine grain and high sharpness. The film gives pleasing color quality with good separation between similar colors. It is designed for use with daylight, electronic flash, or blue flashbulbs. This is a great film to use when exposure requirements are demanding but not severe enough to require a very high-speed film, such as for photographing subjects in daylight outdoors when conditions are less than optimum and you want to stop action or use a telephoto lens. Another major use for EKTACHROME 200 Film is for existing-light subjects, such as performers illuminated by carbon-arc spotlights or indoor scenes illuminated by existing daylight. An exceptional feature is that with special processing, you can expose the film at speeds higher than its normal speed.

Sizes Available: 135-20 exposures, 135-36 exposures; 126-20 exposures.

Film Code Letter Designation: ED. **Film Code Number:** 5076.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
DAYLIGHT	ISO (ASA) 200*	None
PHOTOLAMPS 3400 K	ISO (ASA) 64	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 50	No. 80A

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

*See footnote in Daylight Exposure Table below.

Daylight Exposure Table [ISO (ASA) 200]: For average subjects. Exposure recommendations are for cameras with focal-plane shutters. For leaf-type shutters, see explanation under table.

Shutter Speed 1/500 Second*	Shutter Speed 1/250 Second*				
Bright or Hazy Sun Distinct Shadows	Bright or Hazy Sun Distinct Shadows	Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade‡
On Light Sand or Snow	Average Subjects				
f/16	*f*/16†	*f*/11	*f*/8	*f*/5.6	*f*/5.6

*When using a camera with a leaf-type shutter under lighting conditions that require high shutter speeds and medium or small lens openings (lens openings beginning about midway on your camera lens-opening scale), reduce exposure as follows: at 1/250 second, use a lens opening ½ stop smaller than indicated; at 1/500 second, use a lens opening 1 stop smaller than indicated.

†For frontlighted subjects. For backlighted close-up subjects use *f*/8 at 1/250 second.

‡Subject shaded from the sun but lighted by a large area of sky.

Existing-Light Exposure Table [ISO (ASA) 200]: Use an exposure meter or camera with built-in meter if you have one. For cameras without exposure meters or for scenes that are difficult to meter, try the settings suggested in the table. These exposures are *guides;* for more assurance, bracket your exposures 1 stop on each side of the suggested exposure.

Picture Subject	Shutter Speed	Lens Opening
Skylines—10 minutes after sunset	1/60	*f*/4
Interiors with Bright Fluorescent Light*	1/30	*f*/4
Ice Shows, Circuses—Spotlighted acts (carbon arc)	1/125	*f*/2.8
Brightly Lighted Downtown Street Scenes at Night	1/30	*f*/2.8
Brightly Lighted Nightclub or Theatre Districts at Night—Las Vegas or Times Square Store Window Displays at Night	1/30	*f*/4

*May require correction filters for optimum results. See page 47.

Picture Subject	Shutter Speed	Lens Opening
Neon and Other Lighted Signs at Night	1/60	*f*/4
Floodlighted Buildings, Fountains, Monuments	1/2†	*f*/4
Christmas Lighting, Trees—Indoor and Outdoor	1†	*f*/5.6
Fairs, Amusement Parks at Night	1/30	*f*/2
Night Football, Baseball, Racetracks	1/60	*f*/2.8

†Use a camera support for exposure times longer than 1/30 second.

▭ Tungsten light produces yellow-red color rendition.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number*	60	70	85	100	120	140	170	200	240	280

*If your slides are consistently too blue, use a No. 81B filter and increase your exposure by ⅓ stop.

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flash-cube	HI-POWER Flash Cube	AG-1B	M 2 B	AG-1B	M 2 B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	130	180	90	120	130	170	180	180	NR	260	NR
M	1/30	85	120	65	NR	90	NR	130	170	180	240	260
	1/60	85	120	65	NR	90	NR	130	160	130	220	180
	1/125	70	100	55	NR	75	NR	110	130	85	180	120
	1/250	55	80	45	NR	65	NR	90	110	60	150	85
	1/500	45	65	34	NR	50	NR	70	80	44	110	60

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure compensation for different exposure times.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+½ stop No Filter	NR	NR

NR—Not Recommended.

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

Special Processing for Increased Film Speed: You can increase the effective speed of this film, in 135 size, 2 times to ISO (ASA) 400 when you order special processing by Kodak. Use the KODAK Special Processing Envelope, ESP-1, sold by photo dealers. The cost of the ESP-1 Envelope is in addition to the regular charge for KODAK EKTACHROME Film processing. Follow the instructions and exposure recommendations included with the envelope. Other laboratories may process this film to various film speeds. This special processing service is not available from Kodak in most foreign countries.

You Can Process the Film Yourself: Use the KODAK EKTACHROME Film Processing Kit, Process E-6, or equivalent, sold by photo dealers. By changing the first development time, you can change the speed of the film to any of a variety of film speeds. See page 55.

DEFINITION

Graininess	Resolving Power	Sharpness
Very Fine	High	High

KODAK EKTACHROME 400 Film (Daylight)

For Color Slides

A very high-speed color-slide film for photographing dimly lighted subjects, such as those in existing light; fast action; and subjects that require both good depth of field and high shutter speeds. It lets you take flash pictures at greater distances than other Kodak color-slide films. This is Kodak's fastest film for color slides—ISO (ASA) 400. The film is color-balanced for daylight, electronic flash, or blue flashbulbs. You can also use this film for photographing performers illuminated by carbon-arc spotlights, and the film is excellent for indoor scenes illuminated by existing daylight. EKTACHROME 400 Film has fine grain in addition to its high speed. An exceptional feature of this film is the excellent results you can obtain with special processing to achieve a film speed of ISO (ASA) 800. The film can also be processed to various other speeds. See page 55.

Sizes Available: 135-20 exposures, 135-36 exposures; 120.

Film Code Letter Designation: EL.

Film Code Numbers: 5074—size 135; 6074—size 120.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
DAYLIGHT	ISO (ASA) 400*	None
PHOTOLAMPS 3400 K	ISO (ASA) 125	No. 80B
TUNGSTEN 3200 K	ISO (ASA) 100	No. 80A

*See footnote in Daylight Exposure Table below.

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure Table [ISO (ASA) 400]: For average subjects. Exposure recommendations are for cameras with focal-plane shutters. For leaf-type shutters, see explanation under table.

Shutter Speed 1/1000 Second	Shutter Speed 1/500 Second*				
Bright or Hazy Sun Distinct Shadows On Light Sand or Snow	Bright or Hazy Sun Distinct Shadows Average Subjects	Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade‡
f/16	*f*/16†	*f*/11	*f*/8	*f*/5.6	*f*/5.6

*When using a camera with a leaf-type shutter under lighting conditions that require high shutter speeds and medium or small lens openings (lens openings beginning about midway on your camera lens-opening scale), reduce exposure as follows. At 1/500 second, use a lens opening 1 stop smaller than indicated. If you set your shutter at 1/250 second, use a lens opening ½ stop smaller than your exposure meter indicates.

†For frontlighted subjects. For backlighted close-up subjects use *f*/8 at 1/500 second.

‡Subject shaded from the sun but lighted by a large area of sky.

Existing-Light Exposure Table [ISO (ASA) 400]: Use an exposure meter or camera with built-in meter if you have one. For cameras without exposure meters or for scenes that are difficult to meter, try the settings suggested in the table. These exposures are *guides*; for more assurance, bracket your exposures 1 stop on each side of the suggested exposure.

Picture Subject	Shutter Speed	Lens Opening
Skylines—10 minutes after sunset	1/60	*f*/5.6
Distant View of City Skyline at Night	1†	*f*/2.8
Interiors with Bright Fluorescent Light*	1/60	*f*/4
Ice Shows, Circuses—Spotlighted acts (carbon arc)	1/250	*f*/2.8
Brightly Lighted Downtown Street Scenes at Night	1/60	*f*/2.8
Brightly Lighted Nightclub or Theatre Districts at Night—Las Vegas or Times Square Store Window Displays at Night	1/60	*f*/4

*May require correction filters for optimum results.

Picture Subject	Shutter Speed	Lens Opening
Neon and Other Lighted Signs at Night	1/125	*f*/4
Floodlighted Buildings, Fountains, Monuments	1/15†	*f*/2
Christmas Lighting, Trees—Indoor and Outdoor	1/15†	*f*/2
Fairs, Amusement Parks at Night	1/30	*f*/2.8
Night Football, Baseball, Racetracks	1/125	*f*/2.8
Stage Shows—Average lighting	1/60	*f*/2.8
Bright lighting	1/125	*f*/4

†Use a tripod or other firm camera support.

▭ Tungsten light produces yellow-red color rendition.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number*	85	100	120	140	170	200	240	280	340	400

*If your slides are consistently too blue, use a No. 81B filter and increase your exposure by ⅓ stop.

Flash Guide Numbers: *Use blue flashbulbs or flashcubes.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	HI-POWER Flashcube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	180	260	130	170	180	240	260	260	NR	360	NR
M	1/30	120	170	90	NR	130	NR	180	240	260	340	360
	1/60	120	170	90	NR	130	NR	180	220	180	320	260
	1/125	100	140	75	NR	110	NR	150	180	120	260	170
	1/250	75	110	65	NR	90	NR	130	150	85	220	120
	1/500	65	90	50	NR	70	NR	100	110	60	160	85

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment for the filter indicated.

Exposure Time in Seconds						
1/10,000	1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	None No Filter	+½ stop No Filter	+1½ stops CC10C	+2½ stops CC10C

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

Special Processing for Increased Film Speed: You can increase the effective speed of this film 2 times to ISO (ASA) 800 when you order special processing by Kodak. Use the KODAK Special Processing Envelope, ESP-1, sold by photo dealers. The cost of the ESP-1 Envelope is in addition to the regular charge for KODAK EKTACHROME Film processing. Follow the instructions and exposure recommendations included with the envelope. Other laboratories may process this film to various film speeds. This special processing service is not available from Kodak in most foreign countries.

You Can Process the Film Yourself: Use the KODAK EKTACHROME Film Processing Kit, Process E-6, or equivalent, sold by photo dealers. By changing the first development time, you can change the speed of the film to any of a variety of film speeds up to ISO (ASA) 1600. See page 55.

DEFINITION

Graininess	Resolving Power	Sharpness
Fine	Medium	High

For Color Slides

A high-speed color-slide film for photographing subjects lighted by tungsten light. EKTACHROME 160 Film (Tungsten) features excellent color reproduction, very fine grain, and high sharpness together with high film speed. It's designed for use with 3200 K tungsten lamps, but it's excellent for existing tungsten light, such as the light from household lamps and other general-purpose lamps. Outdoors at night you can use this film for pictures of illuminated buildings, fountains, statues, signs, street scenes, and similar subjects. You can take pictures in daylight or with electronic flash or blue flashbulbs when you use a No. 85B filter over your camera lens. An exceptional feature is that with special processing, you can expose the film at speeds higher than its normal speed.

Size Available: 135-20 exposures, 135-36 exposures.

Film Code Letter Designation: ET. **Film Code Number:** 5077.

EXPOSURE

Speeds and Filter Recommendations:

Type of Light	Film Speed	Filter
TUNGSTEN 3200 K	**ISO (ASA) 160**	**None**
PHOTOLAMPS 3400 K	ISO (ASA) 125	No. 81A
DAYLIGHT	ISO (ASA) 100	No. 85B

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Tungsten Lamps—3200 K [ISO (ASA) 160]: The following table is based on the use of two 500-watt reflector-type tungsten lamps 3200 K. Use one as a fill-in light close to the camera at lens level; the other as the main light on the opposite side of the camera, 2 to 4 feet (0.6 to 1.2 metres) higher, and at a 45-degree angle from the camera-subject axis.

EXPOSURE TABLE FOR TUNGSTEN LAMPS 3200 K

Lamp-to-Subject Distance in Feet (Metres) · Set Shutter Speed at 1/60 Second

Lamp	Lens Opening ▶	*f*/8	*f*/5.6	*f*/4	*f*/2.8
General Electric EAL (reflector type)	Main Light	4 (1.2 m)	5½ (1.7 m)	8 (2.4 m)	11 (3.4 m)
	Fill-in Light	5½ (1.7 m)	8 (2.4 m)	11 (3.4 m)	15½ (4.7 m)
Sylvania DXH, Type R-32 (reflector type)	Main Light	5 (1.5 m)	7 (2.1 m)	10 (3 m)	13½ (4.1 m)
	Fill-in Light	7 (2.1 m)	10 (3 m)	13½ (4.1 m)	20 (6 m)

NOTE: Use these camera settings as guides only. The lamp-to-subject distances give a lighting ratio of about 3:1. For a 2:1 ratio, place the fill-in light at the same distance from the subject as the main light and use a lens opening ½ stop smaller.

Existing-Light Exposure Table [ISO (ASA) 160]: If you don't have an exposure meter or camera with a built-in meter, try the settings suggested in the table. These exposures are *guides;* for more assurance, bracket your exposures 1 stop on each side of the suggested exposure.

Picture Subject	Shutter Speed	Lens Opening
Home Interiors at Night—		
Areas with bright light	1/30	*f*/2
Areas with average light	1/15*	*f*/2
Candlelighted Close-Ups	1/8*	*f*/2
Indoor, Outdoor Christmas Lighting at Night	1*	*f*/5.6
Brightly Lighted Downtown Street Scenes at Night	1/30	*f*/2.8
Brightly Lighted Theatre Districts—Las Vegas or Times Square	1/30	*f*/4
Neon Signs, Other Lighted Signs	1/60	*f*/4
Store Windows at Night	1/30	*f*/4
Floodlighted Buildings, Fountains, Monuments	1/2*	*f*/4
Distant View of City Skyline at Night	1*	*f*/2
Fairs, Amusement Parks	1/30	*f*/2

*Use a tripod or other firm camera support.

Picture Subject	Shutter Speed	Lens Opening
Aerial Fireworks Displays—		
Keep camera shutter open on BULB for several bursts	BULB*	*f*/11
Night Football, Baseball, Racetracks†	1/60	*f*/2.8
Basketball, Hockey, Bowling	1/60	*f*/2
Boxing, Wrestling	1/125	*f*/2
Stage Shows—		
Average lighting	1/30	*f*/2.8
Bright lighting	1/60	*f*/4
Circuses—Floodlighted acts	1/30	*f*/2.8
Ice Shows—Floodlighted acts	1/60	*f*/2.8
School—Stage and auditorium	1/15*	*f*/2
Swimming Pool—Indoors, tungsten lights above water	1/30	*f*/2
Church Interiors—Tungsten lights	1/15*	*f*/2

†When lighting at these events is provided by mercury-vapor lamps, you'll get better results by using Daylight film.

Daylight Exposure Table [ISO (ASA) 100]: For average subjects. *Use a No. 85B filter.*

Shutter Speed 1/250 Second	Shutter Speed 1/125 Second				
Bright or Hazy Sun Distinct Shadows	Bright or Hazy Sun Distinct Shadows	Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/16*	*f*/11	*f*/8	*f*/5.6	*f*/5.6

*For frontlighted subjects. For backlighted close-up subjects use *f*/8 at 1/125 second.
†Subject shaded from the sun but lighted by a large area of sky.

Electronic Flash Guide Numbers: *Use a No. 85B filter.* This table is for use with electronic flash units rated in beam candlepower seconds (BCPS). To determine the *f*-number for average subjects, divide the proper guide number by the flash-to-subject distance in feet.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	40	50	60	70	85	100	120	140	170	200

Flash Guide Numbers: *Use blue flashbulbs or flashcubes and a No. 85B filter.** Divide the guide number by the flash-to-subject distance in feet to find the *f*-number for average subjects.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	HI-POWER Flash Cube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B†	M3B 5B 25B	26B†
X	1/30	90	130	65	85	90	120	130	130	NR	180	NR
M	1/30	60	85	45	NR	65	NR	90	120	130	170	180
	1/60	60	85	45	NR	65	NR	90	110	90	160	130
	1/125	50	70	38	NR	55	NR	75	90	60	130	85
	1/250	38	55	32	NR	45	NR	65	75	42	110	60
	1/500	32	45	24	NR	34	NR	50	55	30	80	44

*If you prefer, you can use clear flashbulbs. Multiply the guide numbers in the table by 1.4, and use a No. 85C filter with AG-1 and M3 flashbulbs or a No. 81EF filter with other clear flashbulbs.
†Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: This table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment for the filter indicated.

Exposure Time in Seconds					
1/1000	1/100	1/10	1	10	100
None No Filter	None No Filter	None No Filter	+½ stop CC10R	+1 stop CC15R	NR

NR—Not Recommended.

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer.

Special Processing for Increased Film Speed: You can increase the speed of this film 2 times to ISO (ASA) 320 when you order special processing by Kodak. Use the KODAK Special Processing Envelope, ESP-1, sold by photo dealers. The cost of the ESP-1 Envelope is in addition to the regular charge for KODAK EKTACHROME Film processing. Follow the instructions and exposure recommendations included with the envelope. Other laboratories may process this film to various film speeds. This special processing service is not available from Kodak in most foreign countries.

You Can Process the Film Yourself: Use the KODAK EKTACHROME Film Processing Kit, Process E-6, or equivalent, sold by photo dealers. By changing the first development time, you can change the speed of the film to any of a variety of film speeds. See page 55.

DEFINITION

Graininess	Resolving Power	Sharpness
Very Fine	High	High

For Color Slides

KODAK EKTACHROME Infrared Film is a fast "false-color" film for experimental pictorial photography when you want unusual and abstract results. This film is sensitive to both visible and infrared radiation. The film records colors differently from what we normally see. For example, green grass and trees become red, a red rose records as yellow, and black cloth may turn out red, but a blue sky photographs as blue. Flesh tones will have a greenish cast. EKTACHROME Infrared Film is designed for daylight-quality illumination with a No. 12 yellow filter over the camera lens. Or you can use a No. 15 deep-yellow filter, which is generally more available, for results very similar to those with a No. 12 filter. This film is primarily intended for aerial photography and some scientific applications.

Film Storage and Camera Loading: Store unexposed film in a freezer at 0 to −10°F (−18 to −23°C) in the original sealed container. Before using the film, allow it to warm up to room temperature for about two hours after removal from the freezer. Load and unload your camera in subdued light. Have the film processed promptly after exposure.

Size Available: 135-20 exposures.

Film Code Letter Designation: IE.

Film Code Number: 2236.

EXPOSURE

Speeds and Filter Recommendations: Exposure meter readings serve only as rough guides for daylight exposures with this film since the ratio of visible to infrared radiation varies, and exposure meters respond to visible light only. For more assurance of properly exposed pictures, bracket your exposures. See page 100. For pictorial slides taken by daylight, electronic flash, or blue flash, you can use a No. 12 or No. 15 filter or other filters for different color effects. For scientific and other critical applications, you should use the No. 12 filter. For critical use with photolamp 3400 K illumination, you should use a No. 12 filter with a KODAK Color Compensating Filter CC20C (cyan) plus a Corning Glass Filter CS No. 3966 (1-59) and a meter setting of 50. No focus correction is required with EKTACHROME Infrared Film.

The film speeds in the following table are for use with exposure meters or cameras marked for ISO or ASA speeds or Exposure Indexes.

Type of Light	Film Speed	Filter
DAYLIGHT	100	No. 12 or 15
PHOTOLAMPS 3400 K	50	No. 12 or 15, plus CC50C-2*

*See section on "Photolamps" on the next page.

NOTE: If your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Daylight Exposure: *Use a No. 12 or No. 15 filter.* For frontlighted, average subjects in bright sunlight, use 1/125 second *f*/16 as the basis for trial exposures.

Electronic Flash Guide Numbers: *Use a No. 12 or No. 15 filter.* This table is intended as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	45	55	65	80	95	110	130	160	190	220

Flash Guide Numbers: *Use blue flashbulbs or flashcubes and a No. 12 or No. 15 filter.* Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects. Flashbulbs and flashcubes are not recommended for critical use.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	HI-POWER Flash Cube	AG-1B	M 2 B	AG-1B	M 2 B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	100	140	75	100	100	130	150	140	NR	200	NR
M	1/30	70	90	50	NR	70	NR	100	130	140	180	200
	1/60	65	90	50	NR	70	NR	100	120	100	180	140
	1/125	55	80	42	NR	60	NR	85	100	70	150	100
	1/250	44	65	36	NR	50	NR	70	85	50	120	70
	1/500	36	50	28	NR	38	NR	55	65	34	90	50

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Photolamps—3400 K: The following table is based on the use of two 500-watt reflector-type photolamps 3400 K or two No. 2 photoflood lamps 3400 K in 12-inch reflectors. Place one lamp on each side of the camera at an angle of 45 degrees to the camera-subject axis. Use a No. 12 or No. 15 filter, plus a KODAK Color Compensating Filter CC50C-2 over your camera lens. These exposure settings are suggested starting points, so it's a good idea to bracket your exposure.

EXPOSURE TABLE FOR 500-WATT PHOTOLAMPS 3400 K			
Set Shutter Speed at 1/30 Second			
Lamp-to-Subject Distance	3 ft (0.9 m)	4½ ft (1.4 m)	6½ ft (2 m)
Lens Opening	*f*/5.6 ↓ 8	*f*/4 ↓ 5.6	*f*/2.8 ↓ 4

This table is based on the use of new lamps. After the lamps have burned for 1 hour, use a lens opening ½ stop larger; after 2 hours, use a lens opening 1 stop larger.

Reciprocity Characteristics: The following table gives the exposure and filter compensation for different exposure times. The exposure increase includes the adjustment required when a filter is indicated.

Exposure Time in Seconds		
1/1000	1/100	1/10
None No Filter	None No Filter	+1 stop CC20B

PROCESSING

You can have your film processed by Kodak or another laboratory by returning the film to your photo dealer, or by mailing it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides.

To process the film yourself, use KODAK EKTACHROME Film Processing Chemicals, Process E-4, or equivalents, sold by photo dealers.

DEFINITION

Graininess	Resolving Power	Sharpness
Fine	Medium	Medium

KODAK EKTACHROME Slide Duplicating Film 5071 and KODAK EKTACHROME SE Duplicating Film SO-366 (Process E-6)

For Color Slides

These films are for making duplicate color slides from original slides made on color-slide films, such as KODACHROME or KODAK EKTACHROME Films. EKTACHROME Slide Duplicating Film 5071 is primarily intended for slow exposure times with tungsten illumination 3200 K, but you can also use the film with sunlight. EKTACHROME SE Duplicating Film SO-366 is primarily intended for short exposure times with electronic flash. These films produce excellent color-slide duplicates. It's often difficult to distinguish between the duplicate and the original when appropriate filters are used during exposure. Since a duplicate slide, however, is a photograph of another photograph, there may be a slight reduction in photographic quality when critical quality standards are applied. Catalog Number for SO-366 Film: CAT 159 0223.

Film Storage: Store unexposed film in a refrigerator at 55°F (13°C) or lower in the original sealed container. Have the films processed promptly after exposure.

Size Available: 135-36 exposures. **Film Code Number:** 5071; SO-366.

EXPOSURE You can make duplicate slides by using a single-lens reflex camera with a through-the-lens exposure meter and a slide-duplicating attachment or slide-duplicating equipment. You can also use a contact printer. Using a diffused light source and a lens to transmit the image of the original onto the duplicating film offers the least difficulty with dust and scratches.

The 5071 film is primarily for use at exposure times of approximately 1 second with 3200 K tungsten illumination, such as tungsten photo enlarger lamps or tungsten halogen lamps. You can also use 5071 film with sunlight and exposure times of about 1 second. The SO-366 film is primarily for use at short exposure times of approximately 1/1000 second with electronic flash. In addition you can use the SO-366 film with sunlight at exposure times of 1/10 second or shorter. Exposure with fluorescent lamps is not recommended.

Camera Exposure: For exposure meters marked for ISO or ASA speeds or Exposure Indexes. Use these speeds as starting points for determining proper exposure. With electronic flash, make an exposure series to determine the best lens opening.

Type of Light	Film Speed	Film
TUNGSTEN 3200 K	12*	5071
DAYLIGHT†	12*	5071
DAYLIGHT†	16	SO-366

*For an exposure time of 1 second. If the ISO or ASA speed dial on your camera does not have a speed of 12 on it, set the dial on 25 and increase exposure by 1 stop.

These film speeds are for use with meter readings made through the filters in the table below. The speeds apply when the exposure factor on the film carton is −1.0. The film speed can vary from one film emulsion to another. See page D 25.

†Set a piece of white paper on the ground in sunlight and point your camera with a slide-copying attachment at the paper. Make the meter reading of the original slide in the attachment, not of the white paper directly.

Filter Recommendations: Use these filter packs as starting points for camera exposures.

KODAK Film Original to be Duplicated	Light Source			
	5071 Film		SO-366 Film	
	Tungsten 3200 K‡	Daylight‡	Electronic Flash§	Daylight¶
EKTACHROME 64*, 160*, 200*, 400 KODACHROME II, KODACHROME-X†	40G + 10Y + No. 2B	20G + 35Y + No. 2B	15Y + 05R + No. 2B	05Y + 05C + No. 2B
EKTACHROME-X, High Speed EKTACHROME† EKTACHROME Infrared	30G + 20Y + No. 2B	10G + 45Y + No. 2B	15Y + 15R + No. 2B	05Y + 05R + No. 2B
KODACHROME 25, 40, 64	50G + No. 2B	30G + 25Y + No. 2B	15Y + 05C + No. 2B	05G + 10C + No. 2B

*Also EKTACHROME Professional Films, Process E-6. †Discontinued Kodak films. ‡For 1-second exposure. §If you use an automatic electronic flash unit, set it on manual. ¶For 1/10-second exposure.

Note: Except for the No. 2B filter, the filters in the table are KODAK Color Compensating Filters, CC, or KODAK Color Printing Filters, CP, sold by photo dealers. CC filters are for use in the image-forming light, such as between the camera lens and the original slide, and CP filters are for use only in nonimage-forming light, such as between the light source and the original slide. With dichroic filters some adjustment in filtration may be required.

It's best to place the filters between the slide and the light source. Since the filter and exposure data are starting points, take test pictures with the filters listed and with filters of all six colors that vary at least plus and minus CC10 from the starting point filters. Bracket your exposures by using the indicated exposure and ±½ and ±1 stop exposure increments.

DEFINITION*

Graininess	Resolving Power	Sharpness
Extremely Fine	High	Very High

*These classifications apply to EKTACHROME Slide and SE Duplicating Films only. The quality of duplicate slides will be a function of the original slides being duplicated and the quality of the duplicating equipment.

Adjusting the Filter Pack: To evaluate color balance, project the duplicate slides in a darkened room or compare them with the original slides on an illuminator. If corrections are necessary, determine what color is in excess. You can do this by viewing the duplicates through various CC or CP filters. When judging the color, look at the middletones instead of the highlights or shadows. To adjust the filter pack, you can either remove a filter of the color of the overall hue that's in excess or add a filter that's complementary to the overall hue.

Overall color balance of original	Subtract these filters or—	Add these filters
Yellow	Yellow	Magenta + Cyan (or Blue)
Magenta	Magenta	Yellow + Cyan (or Green)
Cyan	Cyan	Yellow + Magenta (or Red)
Blue	Magenta + Cyan (or Blue)	Yellow
Green	Yellow + Cyan (or Green)	Magenta
Red	Yellow + Magenta (or Red)	Cyan

Keep the number of filters in the filter pack to a minimum by removing filters from the pack whenever possible. For example, if a slide is too red, remove yellow and magenta (or red) filters rather than add a cyan filter. If all three subtractive colors—cyan, magenta, and yellow—are in the filter pack, they form neutral density which increases exposure time without making any correction in color rendition. You should eliminate neutral density by removing the color that has the lowest value and reducing the other two colors by the same amount. For example, if the pack contains 40C + 40M + 20Y, remove 20 filtration from all three filters.

Filter Pack	40C + 40M + 20Y	
Subtract	20C + 20M + 20Y	Removes .20 neutral density.
Minimum Filter Pack	20C + 20M	

You can reduce the 20C + 20M filters further to a 20B filter which is the equivalent. When you change the filter pack, you'll have to adjust the camera exposure settings due to the difference in light absorption of the filters and the number of filter surfaces. If a primary color—red, green, or blue—is in the filter pack with other filters and you want to determine if neutral density would be present when you change the filter pack, for the calculation, convert the primary color to its equivalents in the subtractive colors. For example, 40G = 40C + 40Y.

Adjustment for Emulsion Number Changes: Each quantity of film has an emulsion number. To help you properly expose a new roll of film with a different emulsion number, filter and exposure data are given on the film carton. The filter data are expressed in cyan and yellow filtration from average and exposure data are given in half-stop variations from average.

When you change to a new emulsion number, subtract the data on the old film carton from the data on the new film carton. Remember that in subtracting, a minus value is equivalent to adding. Apply the difference to the filter pack and exposure you were using. The number in the last column is the change in exposure in *f*-stops. For example:

Exposure data on new film carton.	−05C +10Y	+0.5	
Exposure data on old film carton.	+10C −05Y	−0.5	Subtract
Change in filter pack.	−15C +15Y	+1.0	Change in exposure in *f*-stops.

The difference in exposure data from the old emulsion to the new one applies regardless of the filter pack you were using for the old emulsion. Assume with the old emulsion that you used a filter pack of CC30C plus CC50Y and 1-second exposure at *f*/11. Change the filter pack by subtracting CC15C (or by adding CC15R) and adding CC15Y (or subtracting CC15B). Change the exposure by increasing it 1 stop. For example:

Used for old emulsion.		+CC30C + CC50Y	1 second *f*/11
Change for new emulsion.	Add	−CC15C + CC15Y	+ 1 stop
Use for new emulsion.		CC15C + CC65Y	1 second *f*/8

If there is not enough cyan or yellow filtration in the pack to remove, add the complementary filter. Instead of changing the lens opening, you can change the exposure time up to +100 percent or −50 percent. An additional adjustment in the filter pack may be necessary.

The filters suggested on page D 24 are starting points based on the following filter and exposure data on the film carton: 5071 film −05C −30Y −1.0; SO-366 film −10C −60Y −1.0. Use this data for the calculations above when you're using these films for the first time or when you don't have the data for film you used in the past. Insert the data given here for "Exposure data on old film carton" above to calculate the "Change in filter pack" for the film you'll be using. Next insert the filter pack data from the table on page D 24 for the "Used for old emulsion" calculation above to determine the filter pack and exposure to try with the film you're using.

PROCESSING For processing by Kodak or another laboratory, return the film to your photo dealer or mail it directly with the appropriate prepaid processing mailer. Your dealer can also order duplicate slides, color prints, or enlargements from your slides. To process the film yourself, use the KODAK EKTACHROME Film Processing Kit, Process E-6, or equivalent.

For Black-and-White Prints

A fast panchromatic film with extremely fine grain and very high sharpness. Its excellent gradation and wide exposure latitude make it ideally suited to most picture-taking situations. It is the first choice among black-and-white films for general use in most types of roll-film and cartridge cameras—from simple cameras to the most advanced models.

Sizes Available: 110-12 exposures; 126-12 exposures; 120; 127; 620.

Film Code Letter Designation: VP.

Film Code Numbers: 7042—size 110; 8041—size 126; 6041—sizes 120, 127, 620.

EXPOSURE

Speed: ISO (ASA) 125

Daylight Exposure Table: For average subjects.

Shutter Speed 1/250 Second			Shutter Speed 1/125 Second		
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/11*	*f*/8	*f*/8	*f*/5.6	*f*/5.6

*For frontlighted subjects. For backlighted close-up subjects use *f*/8 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Filter Factors: Increase the normal exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Filter	No. 6	No. 8	No. 15	No. 11	No. 25	No. 58	No. 47	Polarizing Screen
Daylight	1.5	2*	2.5	4	8	6	6	2.5
Tungsten	1.5	1.5	1.5	4*	5	6	12	2.5

*For correct gray-tone rendering of colored objects.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	45	55	65	80	95	110	130	160	190	220

Flash Guide Numbers: Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects. These guide numbers are for blue flashbulbs. If you use clear flashbulbs, reduce the lens opening by ⅔ stop.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flash-cube	HI-POWER Flash Cube	AG-1B	M 2 B	AG-1B	M 2 B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	100	140	75	100	100	130	150	140	NR	200	NR
M	1/30	70	90	50	NR	70	NR	100	130	140	180	200
	1/60	65	90	50	NR	70	NR	100	120	100	180	140
	1/125	55	80	42	NR	60	NR	85	100	70	150	100
	1/250	44	65	36	NR	50	NR	70	85	50	120	70
	1/500	36	50	28	NR	38	NR	55	65	34	90	50

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: See page D 41.

DEVELOPMENT

Safelight: *Total darkness required.* However, when development is half completed, you can use a safelight at 4 feet (1.2 metres) for a *few* seconds. Equip the safelight with a KODAK Safelight Filter No. 3 (dark green), or equivalent, and a 15-watt bulb.

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*				
	65°F (18°C)	**68°F (20°C)**	70°F (21°C)	72°F (22°C)	75°F (24°C)
D-76	8	**7**	5½	5	4½
D-76 (1:1)†	11	**9**	8	7	6
MICRODOL-X	10	**9**	8	7	6
MICRODOL-X (1:3)†	15	14	13	12	**11**
POLYDOL	8	**6**	5	4½	4
HC-110 (Dilution B)	6	**5**	4½	4	2

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.
†For greater sharpness.

Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5, at 65 to 75°F (18 to 24°C), for 30 seconds with agitation. You can use a running-water rinse if an acid stop bath is not available.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 5 to 10 minutes, or KODAK Rapid Fixer or KODAFIX Solution for 2 to 4 minutes, at 65 to 75°F (18 to 24°C) with agitation.

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.
Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place.

Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Extremely Fine	High	Very High	High

*For good-quality negatives.

For Black-and-White Prints

A general-purpose panchromatic film for 35 mm cameras that offers the optimum combination of a fast speed, extremely fine grain, and excellent picture sharpness even at high degrees of enlargement. It's ideally suited to most picture-taking situations.

Size Available: 135-20 exposures, 135-36 exposures.

Film Code Letter Designation: PX.

Film Code Number: 5062.

EXPOSURE

Speed: ISO (ASA) 125

Daylight Exposure Table: For average subjects.

Shutter Speed 1/250 Second			Shutter Speed 1/125 Second		
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/11*	*f*/8	*f*/8	*f*/5.6	*f*/5.6

*For frontlighted subjects. For backlighted close-up subjects use *f*/8 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Filter Factors: Increase the normal exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Filter	No. 6	No. 8	No. 15	No. 11	No. 25	No. 58	No. 47	Polarizing Screen
Daylight	1.5	2*	2.5	4	6	8	6	2.5
Tungsten	1.2	1.5	1.5	4*	4	8	12	2.5

*For correct gray-tone rendering of colored objects.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	45	55	65	80	95	110	130	160	190	220

Flash Guide Numbers: Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects. These guide numbers are for blue flashbulbs. If you use clear flashbulbs, reduce the lens opening by ⅔ stop.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flash-cube	Hi-POWER Flash Cube	AG-1B	M 2 B	AG-1B	M 2 B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	100	140	75	100	100	130	150	140	NR	200	NR
M	1/30	70	90	50	NR	70	NR	100	130	140	180	200
	1/60	65	90	50	NR	70	NR	100	120	100	180	140
	1/125	55	80	42	NR	60	NR	85	100	70	150	100
	1/250	44	65	36	NR	50	NR	70	85	50	120	70
	1/500	36	50	28	NR	38	NR	55	65	34	90	50

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: See page D 41.

DEVELOPMENT

Safelight: *Total darkness required.* However, when development is half completed, you can use a safelight at 4 feet (1.2 metres) for a *few* seconds. Equip the safelight with a KODAK Safelight Filter No. 3 (dark green), or equivalent, and a 15-watt bulb.

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*				
	65°F (18°C)	**68°F (20°C)**	70°F (21°C)	72°F (22°C)	75°F (24°C)
D-76	6½	**5½**	5	4½	3¾
D-76 (1:1)†	8	**7**	6½	6	5
MICRODOL-X	8	**7**	6½	6	5½
MICRODOL-X (1:3)†	—	—	11	10	**9½**
POLYDOL	6½	**5½**	4¾	4¼	3¼
HC-110 (Dilution B)	6	**5**	4½	4	3½

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.
†For greater sharpness.

Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5 at 65 to 75°F (18 to 24°C), for 30 seconds with agitation. You can use a running-water rinse if an acid stop bath is not available.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 5 to 10 minutes, or KODAK Rapid Fixer or KODAFIX Solution for 2 to 4 minutes, at 65 to 75°F (18 to 24°C) with agitation.

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.
Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place.

Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Extremely Fine	High	Very High	High

*For good-quality negatives.

For Black-and-White Prints

Extremely fine grain panchromatic films with very high resolving power and very high sharpness. They have adequate speed for many picture-taking situations. These are excellent films to use when you want prints made with a very high degree of enlargement. With special processing, the 135-size film will produce positive black-and-white slides.

Sizes Available: PANATOMIC-X Film, 135-20 exposures, 135-36 exposures; PANATOMIC-X Professional Film, 120.

Film Code Letter Designations: FX; FXP (Professional).

Film Code Numbers: 5060—size 135; 6040—size 120.

EXPOSURE

Speed: ISO (ASA) 32

Daylight Exposure Table: For average subjects.

Shutter Speed 1/125 Second				Shutter Speed 1/60 Second	
Bright or Hazy Sun Distinct Shadows		Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/11	*f*/8*	*f*/5.6	*f*/4	*f*/4	*f*/4

*For frontlighted subjects. For backlighted close-up subjects use *f*/4 at 1/125 second.

†Subject shaded from the sun but lighted by a large area of sky.

Filter Factors: Increase exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Filter	No. 6	No. 8	No. 15	No. 11	No. 25	No. 58	No. 47	Polarizing Screen
Daylight	1.5	2*	2.5	4	8	6	8	2.5
Tungsten	1.5	1.5	1.5	4*	5	6	16	2.5

*For correct gray-tone rendering of colored objects.

Flash Guide Numbers: Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects. These guide numbers are for blue flashbulbs. If you use clear flashbulbs, reduce the lens opening by ⅔ stop.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	Hi-POWER Flashcube	AG-1B	M2B	AG-1B	M2B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	50	70	36	50	50	70	75	75	NR	100	NR
M	1/30	34	50	26	NR	36	NR	50	65	70	90	100
	1/60	34	45	26	NR	36	NR	50	65	50	90	75
	1/125	28	40	22	NR	30	NR	45	55	34	75	50
	1/250	22	32	18	NR	26	NR	36	42	24	60	34
	1/500	18	26	14	NR	20	NR	28	32	17	45	24

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	24	28	32	40	50	55	65	80	95	110

Reciprocity Characteristics: See page D 41.

DEVELOPMENT

Safelight: *Total darkness required.* However, when development is half completed, you can use a safelight at 4 feet (1.2 metres) for a *few* seconds. Equip the safelight with a KODAK Safelight Filter No. 3 (dark green), or equivalent, and a 15-watt bulb.

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*				
	65°F (18°C)	**68°F (20°C)**	70°F (21°C)	72°F (22°C)	75°F (24°C)
D-76	6	**5**	4½	4¼	3¾
D-76 (1:1)†	8	**7**	6½	6	5
MICRODOL-X	8	**7**	6½	6	5
MICRODOL-X (1:3)†	13	12	11	10	**8½**
POLYDOL	6½	**5½**	5	4½	3½
HC-110 (Dilution B)	4¾	**4¼**	4	3¾	3¼

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.

†For greater sharpness.

Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5, at 65 to 75°F (18 to 24°C), for 30 seconds with agitation. You can use a running-water rinse if an acid stop bath is not available.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 2 to 4 minutes, or KODAK Rapid Fixer or KODAFIX Solution for 1 to 2 minutes, at 65 to 75°F (18 to 24°C) with agitation.

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.

Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place. Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Extremely Fine	Very High	Very High	Very High

*For good-quality negatives.

SPECIAL PROCESSING FOR SLIDES

Exposing and Processing: When you use PANATOMIC-X Film, 135 size, as a positive slide film, expose it at a speed of **80** for daylight and **64** for tungsten. Process your film in the KODAK Direct Positive Film Developing Outfit. With the temperature of all the solutions at 68°F (20°C), follow the processing steps below. Agitate continuously during the first 30 seconds in each solution, and for 5 seconds every minute thereafter.

1. First Developer ..... 8 minutes
2. Water Rinse ..... 2 to 5 minutes*
3. Bleach Bath ..... 1 minute
4. Clearing Bath ..... 2 minutes
5. Redeveloper ..... 8 minutes
6. Water Rinse ..... 1 minute
7. Fixing Bath ..... 5 minutes
8. Wash ..... 20 minutes

*A 2-minute rinse is sufficient with a running-water wash and good agitation.

Safelight: *Total darkness is required* until you have completed the bleaching step. For the rest of the process you can use a safelight equipped with a KODAK Safelight Filter OA (greenish yellow), or equivalent, and a 15-watt bulb. Keep the safelight at least 4 feet (1.2 metres) from the film. Do not turn on the normal room lights until the film has been fixed, or the highlights may appear gray.

KODAK TRI-X Pan Film

For Black-and-White Prints

A high-speed panchromatic film with fine grain and excellent sharpness. Its high speed makes it especially useful for photographing dimly lighted subjects, such as those in existing light; fast action; subjects requiring good depth of field and high shutter speeds; and for extending the distance range for flash pictures. This is a very versatile film—you can use it to photograph a wide variety of subjects and lighting within the capability of your camera.

Sizes Available: 135-20 exposures, 135-36 exposures; 120.

Film Code Letter Designation: TX.

Film Code Numbers: 5063—size 135; 6043—size 120.

Speed: ISO (ASA) 400

EXPOSURE

Daylight Exposure Table: For average subjects.

Shutter Speed 1/1000 Second	Shutter Speed 1/500 Second	Shutter Speed 1/250 Second			
Bright or Hazy Sun Distinct Shadows	Bright or Hazy Sun Distinct Shadows	Weak Hazy Sun Soft Shadows	Cloudy Bright No Shadows	Heavy Overcast	Open Shade†
On Light Sand or Snow	Average Subjects				
f/16	*f*/16*	*f*/16	*f*/11	*f*/8	*f*/8

*For frontlighted subjects. For backlighted close-up subjects use *f*/11 at 1/250 second.
†Subject shaded from the sun but lighted by a large area of sky.

Filter Factors: Increase exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Filter	No. 6	No. 8	No. 15	No. 11	No. 25	No. 58	No. 47	Polarizing Screen
Daylight	1.5	2*	2.5	4	8	6	6	2.5
Tungsten	1.5	1.5	1.5	3*	5	6	12	2.5

*For correct gray-tone rendering of colored objects.

Existing-Light Exposure Table: Use an exposure meter or an automatic camera if you have one. For cameras without exposure meters, try the settings suggested in the table. These exposures are *guides*; for more assurance, bracket your exposures 1 or 2 stops on each side of the suggested exposure.

Picture Subject	Shutter Speed	Lens Opening
Home Interiors at Night—		
Areas with bright light	1/30	*f*/2.8
Areas with average light	1/30	*f*/2
Candlelighted Close-Ups	1/15*	*f*/2
Interiors with Bright Fluorescent Light	1/60	*f*/4
Indoor, Outdoor Christmas Lighting at Night	1/15*	*f*/2
Brightly Lighted Downtown Street Scenes at Night	1/60	*f*/2.8
Brightly Lighted Theatre Districts—Las Vegas or Times Square	1/60	*f*/4
Neon Signs, Other Lighted Signs at Night	1/125	*f*/4
Store Windows at Night	1/60	*f*/4
Floodlighted Buildings, Fountains, Monuments	1/15*	*f*/2
Distant View of City Skyline at Night	1*	*f*/2.8
Skylines—10 minutes after sunset	1/60	*f*/5.6
Fairs, Amusement Parks at Night	1/30	*f*/2.8

Picture Subject	Shutter Speed	Lens Opening
Aerial Fireworks Displays— Keep camera shutter open on BULB for several bursts	BULB*	*f*/16
Night Football, Baseball, Racetracks	1/125	*f*/2.8
Basketball, Hockey, Bowling	1/125	*f*/2
Boxing, Wrestling	1/250	*f*/2
Stage Shows—		
Average lighting	1/60	*f*/2.8
Bright lighting	1/125	*f*/4
Circuses—Floodlighted acts	1/60	*f*/2.8
Ice Shows—Floodlighted acts	1/125	*f*/2.8
Ice Shows, Circuses— Spotlighted acts (carbon arc)	1/250	*f*/2.8
School—Stage and auditorium	1/30	*f*/2
Swimming Pool—Indoors, tungsten lights above water	1/60	*f*/2
Church Interiors— Artificial light	1/30	*f*/2

*Use a camera support for exposure times longer than 1/30 second.

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	85	100	120	140	170	200	240	280	340	400

Reciprocity Characteristics: See page D 41.

Flash Guide Numbers: Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects. These guide numbers are for blue flashbulbs. If you use clear flashbulbs, reduce the lens opening by ⅔ stop.

Synchronization	Shutter Speed	Cube		Shallow Cylindrical Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector		Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		Flashcube	Hi-POWER Flash Cube	AG-1B	M 2 B	AG-1B	M 2 B	AG-1B	M3B 5B 25B	26B*	M3B 5B 25B	26B*
X	1/30	180	260	130	170	180	240	260	260	NR	360	NR
M	1/30	120	170	90	NR	130	NR	180	240	260	340	360
	1/60	120	170	90	NR	130	NR	180	220	180	320	260
	1/125	100	140	75	NR	110	NR	150	180	120	260	170
	1/250	75	110	65	NR	90	NR	130	150	85	220	120
	1/500	65	90	50	NR	70	NR	100	110	60	160	85

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. Flashcubes have a built-in flashguard. **Do not use flash in an explosive atmosphere.**

DEVELOPMENT

Safelight: *Total darkness required.* However, when development is half completed, you can use a safelight at 4 feet (1.2 metres) for a *few* seconds. Equip the safelight with a KODAK Safelight Filter No. 3 (dark green), or equivalent, and a 15-watt bulb.

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*				
	65°F (18°C)	**68°F (20°C)**	70°F (21°C)	72°F (22°C)	75°F (24°C)
D-76	9	**8**	7½	6½	5½
D-76 (1:1)†	11	**10**	9½	9	8
MICRODOL-X	11	**10**	9½	9	8
MICRODOL-X (1:3)†	—	—	15	14	**13**
DK-50 (1:1)	7	**6**	5½	5	4½
POLYDOL	8	**7**	6½	6	5
HC-110 (Dilution A)	4¼	**3¾**	3¼	3	2½
HC-110 (Dilution B)	8½	**7½**	6½	6	5

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.

†For greater sharpness.

Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5 at 65 to 75°F (18 to 24°C), for 30 seconds with agitation. You can use a running-water rinse if an acid stop bath is not available.

Fix in KODAK Fixer, KODAK Fixing Bath F-5, or KODAFIX Solution for 5 to 10 minutes, or KODAK Rapid Fixer for 2 to 4 minutes, at 65 to 75°F (18 to 24°C) with agitation.

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.

Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place. Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Fine	High	Very High	Moderate

*For good-quality negatives.

For Black-and-White Prints

A panchromatic film for 120-size cameras that has extremely high speed and medium grain. Use ROYAL-X Pan Film for situations where the highest film speed is essential, such as for taking action photographs by existing light or for obtaining adequate depth of field under poor lighting conditions while handholding your camera. This is a good film to use for photographing sports events outdoors at night or indoors in sports arenas under the existing lighting.

Size Available: 120.

Film Code Letter Designation: RX. **Film Code Number:** 6046.

Camera Loading: Because of the extremely high speed of this film, always load and unload your camera in subdued light.

EXPOSURE

Speed: ISO (ASA) 1250. For low-contrast scenes, you can obtain good negatives by setting your exposure meter for film-speed numbers up to 2000 with normal development, and up to 4000 if you increase development 50 percent by using the extended times in the development table.

Suggested Exposure Settings:

Lighting Conditions	Average Subject—Normal Development	Low-Contrast Subject—Extended Development
Existing Light		
Home Interiors at Night—		
Areas with bright light	1/60 sec *f*/4	1/60 sec *f*/5.6
Areas with average light	1/30 sec *f*/4	1/60 sec *f*/4
Night Football, Baseball, Racetracks, Boxing, Wrestling	1/250 sec *f*/4	1/500 sec *f*/4
Basketball, Hockey, Bowling	1/250 sec *f*/2.8	1/250 sec *f*/4
Interiors with Bright Fluorescent Light	1/125 sec *f*/5.6	1/250 sec *f*/5.6
School—Stage and auditorium	1/30 sec *f*/4	1/60 sec *f*/4
Church Interiors—Artificial light	1/30 sec *f*/4	1/60 sec *f*/4
Daylight		
Heavy Overcast or Open Shade—Subject shaded from the sun but lighted by a large area of sky	1/250 sec *f*/16	1/250 sec *f*/22
Cloudy Bright—No shadows	1/250 sec *f*/22	1/500 sec *f*/22
Weak Hazy Sun—Soft shadows	1/500 sec *f*/22	1/500 sec *f*/32
Bright or Hazy Sun—Distinct shadows	1/500 sec *f*/32	—
Flashbulbs		
M3B, 5B, or 25B Flashbulbs at 1/500 Second, M Synchronization, Polished Bowl-Shaped Reflector	*f*/5.6 at 50 feet (15 metres)	*f*/8 at 50 feet (15 metres)

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	150	180	210	250	300	350	420	500	600	700

Filter Factors: Increase the normal exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Filter	No. 6	No. 8	No. 15	No. 11	No. 25	No. 58	No. 47	Polarizing Screen
Daylight	1.5	2*	2.5	4	8	8	6	2.5
Tungsten	1.5	2	2	4*	5	8	12	2.5

*For correct gray-tone rendering of colored objects.

Reciprocity Characteristics: The following table gives the exposure and development compensation for different exposure times. See the discussion about making the development correction on the bottom half of page D 41.

Exposure Time in Seconds	Either: Increase Lens Opening by	Either: Or Use Corrected Exposure Time in Seconds	Change Developing Time by
1/1000	None	No change	+10 percent
1/100	None	No change	None
1/10	None	No change	None
1	+1 stop	2	−10 percent
10	+2 stops	50	−20 percent
100	+3 stops	1200	−30 percent

DEVELOPMENT

This film must be processed by using the following procedure. Only the developers listed are recommended. If a photofinisher processes this film, make sure that they can provide the special processing service required.

Safelight: *Total darkness required.*

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. Note: A slight fog density is normal. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*: Average Subjects 65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)	Low-Contrast Subjects 65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
POLYDOL	8	**7**	6½	6	5	12	**11**	10	9	7½
DK-50	5½	**5**	4¾	4¾	4½	8	**7½**	7	—	6½
HC-110 (Dilution A)	6	**5**	4¾	4½	4¼	9	**7½**	7	6½	6
HC-110 (Dilution B)	10	**9**	8	7½	6½	15	**14**	12	11	10

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.

Note: Use fresh developers, because exhausted developers may produce a deposit of dichroic fog. You can usually swab this off while the film is still wet.

Use an Acid Stop Bath. Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5 at 65 to 75°F (18 to 24°C) for 30 seconds to 1 minute *with continuous agitation*. Drain the film for 2 to 5 seconds before immersing it in the fixing bath. *The use of an acid stop bath is important*—it minimizes the tendency for dichroic stain deposits to form on the film surface.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 5 to 10 minutes, or KODAK Rapid Fixer for 3 to 5 minutes, at 65 to 75°F (18 to 24°C). *Agitate films frequently during fixing.*

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.

Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place.

Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Medium	High	High	Moderately Low

*For good-quality negatives.

For Black-and-White Prints

An extremely high-speed panchromatic film for 35 mm cameras that has extended red sensitivity and coarse grain. Use this film in situations where the highest film speed is essential and fine grain is not important to you, such as for taking action photographs when the light is extremely poor or for obtaining adequate depth of field under poor lighting conditions while handholding your camera. This film's extremely high speed makes it suitable for photographing sports events under adverse conditions outdoors at night or indoors in sports arenas using the existing lighting and telephoto lenses.

Size Available: 135-36 exposures.

Film Code Letter Designation: RE. **Film Code Number:** 2475.

Camera Loading: Because of the extremely high speed of this film, always load and unload your camera in subdued light. After the last exposure, rewind the film *completely* into the magazine before opening your camera to unload the film.

EXPOSURE

Speed: 1000. For exposure meters marked for ISO or ASA speeds or Exposure Indexes. For low-contrast scenes, you can obtain good negatives by setting your exposure meter for film-speed numbers up to 1600 with normal development, and up to 3200 if you increase development 50 percent by using the extended times given in the development table.

Suggested Exposure Settings:

Lighting Conditions	Average Subject—Normal Development	Low-Contrast Subject—Extended Development
Existing Light		
Home Interiors at Night—		
Areas with bright light	1/60 sec *f*/4	1/60 sec *f*/5.6
Areas with average light	1/30 sec *f*/4	1/60 sec *f*/4
Night Football, Baseball, Racetracks, Boxing, Wrestling	1/250 sec *f*/4	1/500 sec *f*/4
Basketball, Hockey, Bowling	1/250 sec *f*/2.8	1/250 sec *f*/4
Interiors with Bright Fluorescent Light	1/125 sec *f*/5.6	1/250 sec *f*/5.6
School—Stage and auditorium	1/30 sec *f*/4	1/60 sec *f*/4
Church Interiors—Artificial light	1/30 sec *f*/4	1/60 sec *f*/4
Daylight		
Heavy Overcast or Open Shade—Subject shaded from the sun but lighted by a large area of sky	1/250 sec *f*/16	1/250 sec *f*/22
Cloudy Bright—No shadows	1/250 sec *f*/22	1/500 sec *f*/22
Weak Hazy Sun—Soft shadows	1/500 sec *f*/22	1/500 sec *f*/32
Bright or Hazy Sun—Distinct shadows	1/500 sec *f*/32	—
Flashbulbs		
M3B, 5B, or 25B Flashbulbs at 1/500 Second, M Synchronization, Polished Bowl-Shaped Reflector	*f*/5.6 at 50 feet (15 metres)	*f*/8 at 50 feet (15 metres)

Electronic Flash Guide Numbers: Use this table as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for average subjects.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number	130	160	190	220	260	320	380	450	530	630

Filter Factors: Increase the normal exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera manual for instructions on exposure with filters. Also, see page 101.

Filter	No. 6	No. 8	No. 15	No. 11	No. 25	No. 58	No. 47	Polarizing Screen
Daylight	1.5	2*	2	6	3	10	6	2.5
Tungsten	1.2	1.2	1.5	6*	2	12	16	3

*For correct gray-tone rendering of colored objects.

Reciprocity Characteristics: The following table gives the exposure and development compensation for different exposure times. See the discussion about making the development correction on the bottom half of page D 41.

Exposure Time in Seconds	Increase Lens Opening by	Change Developing Time by
1/10,000	None	None
1/1000	None	None
1/100	None	None
1/10	None	None
1	+⅔ stop	−10 percent
10	+1⅓ stops	−20 percent
100	+2⅔ stops	−30 percent

DEVELOPMENT

Safelight: *Total darkness required.*

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*				
	65°F (18°C)	**68°F (20°C)**	70°F (21°C)	72°F (22°C)	75°F (24°C)
Average Subjects—					
DK-50	7	**6**	5	4¾	4
HC-110 (Dilution A)	5½	**4½**	4	3½	3
HC-110 (Dilution B)	11	**9**	8	7	6
Low-Contrast Subjects—					
DK-50	10½	**9**	8½	7½	6½
HC-110 (Dilution A)	9½	**8**	7½	6½	5
HC-110 (Dilution B)	17	**15**	12	11	10

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.

Note: Use fresh developers, because exhausted developers may produce a deposit of dichroic fog. You can usually swab this off while the film is still wet.

Use an Acid Stop Bath. Rinse in KODAK Stop Bath SB-1a at 65 to 75°F (18 to 24°C) for 30 seconds to 1 minute *with continuous agitation. The use of an acid stop bath is important*—it minimizes the tendency for dichroic stain deposits to form on the film surface.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 8 to 12 minutes, or KODAK Rapid Fixer for 3 to 5 minutes, at 65 to 75°F (18 to 24°C). *Agitate films frequently during fixing.*

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or soft viscose sponge.

Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place.

Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Coarse	Medium	Very High	Low

*For good-quality negatives.

For Black-and-White Prints

A moderately high-contrast, infrared-sensitive film that has high speed and abstract tone reproduction. With a red filter, it gives striking and unusual effects. The film is often used for pictorial landscape photographs to create an eerie, dream-like quality with light foliage and dark skies. High Speed Infrared Film is useful to show detail ordinarily obscured by atmospheric haze in distant landscapes. It is also useful in aerial, scientific, medical, industrial, legal, and documentary photography, and in photomicrography.

Size Available: 135-20 exposures.

Film Code Letter Designation: HIE. **Film Code Number:** 2481.

Camera Loading: Film magazines must be handled in total darkness when the magazines are outside the film cans. Load and unload your camera only in total darkness. You may want to use a changing bag on location for loading your camera. See your photo dealer for one that's opaque to infrared rays. Store 135 magazines of this film in the tightly closed film cans or in total darkness at 55°F (13°C) or lower.

EXPOSURE

Focusing: Camera lenses do not focus infrared rays in the same plane as visible light rays. Some camera lenses have index marks on their focusing scales for taking infrared pictures. If your lens has one, use it. Otherwise, set your lens at the smallest opening that conditions permit. If you have to use large lens openings, and your lens has no infrared focusing mark, try to focus on the near side of the main subject. Or you can focus normally and then move the entire camera away from the subject by 0.25 percent of the subject-to-lens distance.

Filters: To obtain infrared rendition in your pictures, you must use a filter over the lens (or light source) to absorb the blue and green light to which the film is sensitive. For general photography, a No. 25 filter is recommended; or you can use a No. 29 or No. 70 filter. When you want to record only the infrared radiation, use a No. 89B, No. 88A, No. 87, or No. 87C filter.

Speeds: It's not possible to give exact speeds for KODAK High Speed Infrared Film, because the ratio of infrared to visible light is variable, and exposure meters do not respond to infrared radiation. Similar levels of visible light may be vastly different in the amounts of infrared radiation they contain. Make trial exposures to determine the proper exposure for the conditions under which you take your pictures.

You can use the following speeds as a basis for determining exposures under average conditions with meters marked for ISO or ASA speeds or Exposure Indexes. With cameras that have a built-in exposure meter that makes the reading through a filter used over the lens, use these film speeds and make the meter reading before you put the filter on the camera. Or, use a hand-held exposure meter.

Filter	Film Speed*	
	Daylight	Tungsten
No. 25, 29, 70, or 89B	50	125
No. 87, 88A	25	64
No. 87C	10	25
No Filter	80	200

*Recommended development in KODAK Developer D-76.

Daylight Exposures: Subjects in bright or hazy sunlight, distinct shadows. Use these recommendations as the basis for trial exposures.

Exposed Through a No. 25 Filter	
Distant Scenes	Nearby Scenes
1/125 second *f*/11	1/30 second *f*/11

Photolamps: For use with a No. 25 filter over the camera lens. The following table is based on the use of two 500-watt reflector-type photolamps. Place one lamp on each side of the camera at an angle of 45 degrees to the camera-subject axis.

EXPOSURE TABLE FOR 500-WATT REFLECTOR-TYPE PHOTOLAMPS			
Set Shutter Speed at 1/30 Second			
Lamp-to-Subject Distance	3 ft (0.9 m)	4½ ft (1.4 m)	6½ ft (2 m)
Lens Opening	*f*/11	*f*/8	*f*/5.6

Electronic Flash Guide Numbers: For use with a No. 87 filter. This table is intended as a starting point in determining the correct guide number for electronic flash units rated in beam candlepower seconds (BCPS). Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number for trial exposures.

Output of Unit—BCPS	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number for Trial	20	24	30	35	40	50	60	70	85	100

Flash Guide Numbers: Use a filter such as a No. 25, No. 29, No. 70, or No. 89B with clear flashbulbs. Divide the proper guide number by the flash-to-subject distance in feet to determine the *f*-number. If you use a No. 87 or No. 88A filter, increase exposure by 1 stop. If you use a No. 87C filter, increase exposure by 2 stops.

Synchronization	Shutter Speed	Shallow Cylindrical Reflector	Intermediate-Shaped Reflector	Polished Bowl-Shaped Reflector	Intermediate-Shaped Reflector		Polished Bowl-Shaped Reflector	
		AG-1	AG-1	AG-1	M3 25	26*	M3 25	26*
X	1/30	90	120	180	200	NR	280	NR
M	1/30	60	85	120	170	200	240	280
	1/60	60	85	120	170	130	240	180
	1/125	50	70	100	140	90	200	130
	1/250	40	60	80	110	65	160	90
	1/500	32	45	65	85	50	120	65

*Bulbs for focal-plane shutters; use with FP synchronization. NR—Not Recommended.

WARNING: Bulbs may shatter when flashed; use a flashguard over your reflector. **Do not use flash in an explosive atmosphere.**

Reciprocity Characteristics: The following table gives the exposure compensation for different exposure times.

Exposure Time in Seconds					
1/1000	1/100	1/10	1	10	100
+⅓ stop	None	None	None	None	+⅔ stop or multiply exposure time by 1.6

DEVELOPMENT

Safelight: *Total darkness required.*

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. The most widely used times and temperature are in heavy type. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

KODAK Packaged Developers	Developing Times in Minutes*				
	65°F (18°C)	**68°F (20°C)**	70°F (21°C)	72°F (22°C)	75°F (24°C)
D-76	13	**11**	10	9½	8
HC-110 (Dilution B)	7	**6**	6	5½	5
D-19†	7	**6**	5½	5	4

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.

†For maximum contrast.

Rinse in KODAK Indicator Stop Bath or KODAK Stop Bath SB-5 at 65 to 75°F (18 to 24°C), for 30 seconds with agitation. You can use a running-water rinse if an acid stop bath is not available.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 5 to 10 minutes, or KODAK Rapid Fixer for 2 to 4 minutes, at 65 to 75°F (18 to 24°C) with agitation.

Wash the film for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing, or wipe the surfaces carefully with a KODAK Photo Chamois or a soft viscose sponge.

Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place. Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Fine	Medium	Medium	Moderately Low

*For good-quality negatives.

For Black-and-White Prints

This is a variable-contrast panchromatic film with extended red sensitivity for making reduced (35 mm or smaller) copy negatives of printed matter, such as books, newspapers, maps, engineering drawings, documents, and similar originals, and of color and black-and-white continuous-tone originals. The film produces good quality in copies of originals that contain both line and halftone material. You can vary the contrast by choice of developer. The film's moderate to very high contrast combined with excellent definition characteristics—extremely fine grain, extremely high resolving power, and extremely high sharpness—meet the requirements for the various copying applications. Another valuable application for this film is personal microfilming. You can also use the film for making reverse-text title slides with a black background and light type when you photograph white artwork with black type. For pictorial photography this film has the potential for giant size enlargements when you develop it in a special developer to lower the contrast. For information on pictorial use and the chemicals to purchase for mixing the special developer, write to Kodak at the address given on the inside back cover.

Size Available: 135-36 exposures.

Film Code Letter Designation: TP. **Film Code Number:** 2415.

Camera Loading: Load and unload your camera in subdued light. After the last exposure, rewind the film *completely* into the magazine before opening your camera to unload the film.

EXPOSURE

Speed: Film speeds are for exposure meters marked for ISO or ASA speeds or Exposure Indexes and recommended development. Use for determining trial exposures for copying. For more assurance, bracket the estimated exposure by 1 or 2 stops using half-stop increments.

Type of Original	Contrast Required*	Film Speed	
		Gray Card†	White Card‡
Printed matter; line drawings—good condition	Maximum—Very High§	320	64
Combination of printed matter and half-tone illustrations; handwritten copy; pencil drawings; originals with smudged or broken lines	High	200	40
Continuous-tone originals; photographs; artwork; paintings	Moderate	80	16

*See table on next page for developer and development time to use for required contrast.

†For reflected-light meter readings, including in-camera meter readings, of an 18 percent reflectance gray card, such as the KODAK Gray Card—gray side, or incident-light meter readings at the copyboard.

‡For reflected-light exposure meter readings, including readings with in-camera meters, from a matte-white card of 90 percent reflectance at the copyboard.

§Use this contrast and corresponding speeds for making reverse-text slides. After photographing white artwork with black type, mount the processed negatives made on this film in slide mounts for projection.

Illumination: The recommended lighting setup for copying consists of two light sources, one on either side of the copy material, with the lights placed so that they are at an angle of 45 degrees to the material. Use a sheet of clean plate glass to hold the original flat.

Exposure Examples: With two No. 2 photoflood lamps in matte-surfaced reflectors 4 feet (1.2 metres) from the copy, use an exposure of about 1/60 second at *f*/8. With No. 1 photoflood lamps the same distance from the copy, use about 1/30 second at *f*/8. These exposures are based on development for maximum contrast in KODAK Developer D-19. See page D 41.

Filter Factors: Usually, a filter is not required to achieve the desired contrast between background and subject matter. In special cases, such as in copying old newspapers or books with yellowed paper, use a No. 8 yellow filter or a No. 15 deep-yellow filter. For copying blueprints, use a No. 25 red filter. Increase the normal exposure by the filter factor in the table. However, if your camera has a built-in exposure meter that makes the reading through a filter used over the lens, see your camera instructions for exposure with filters. Also, see page 101.

Filter	No. 8	No. 15	No. 11	No. 13	No. 25	No. 58	No. 47
Tungsten	1.2	1.2	5	6	2	12	25

Note: The filter factors are based on a 1-second exposure with tungsten light and development in KODAK HC-110 Developer, Dilution D, for 8 minutes at 68°F (20°C).

Reciprocity Characteristics: Between 1/1000 and 1 second exposure times no correction for reciprocity effect is necessary.

DEVELOPMENT

Safelight: *Total darkness required.* However, when development is half completed, you can use a safelight at 4 feet (1.2 metres) for a *few* seconds. Equip the safelight with a KODAK Safelight Filter No. 3 (dark green), or equivalent, and a 15-watt bulb.

Developing Times are for small roll-film tanks with agitation for 5 seconds at 30-second intervals throughout development. If your negatives are consistently too low in contrast, increase development time; if too high in contrast, decrease development time.

Contrast	KODAK Packaged Developer	Developing Times in Minutes* 68°F (20°C)
Maximum—Very High	D-19	4
High	HC-110 (Dilution D)†	8
Moderate	HC-110 (Dilution F)†	6

*Unsatisfactory uniformity may result with development times shorter than 5 minutes.

†You can prepare HC-110 Developer, Dilution D, by diluting one part stock solution, mixed according to package instructions, with 9 parts water and Dilution F by diluting one part stock solution with 19 parts water. Mix both dilutions D and F fresh and discard frequently rather than replenish.

Rinse in KODAK Indicator Stop Bath, KODAK Stop Bath SB-1a, or KODAK Stop Bath SB-5, at 65 to 70°F (18 to 21°C), for 30 seconds with agitation. You can use a running-water rinse if an acid stop bath is not available.

Fix in KODAK Fixer or KODAK Fixing Bath F-5 for 2 to 4 minutes, or KODAK Rapid Fixer for 1½ to 3 minutes, at 65 to 70°F (18 to 21°C) with agitation.

Wash the film for 15 minutes in running water at 65 to 70°F (18 to 21°C). To minimize drying marks, treat the film in KODAK PHOTO-FLO Solution after washing.

Note: Keep temperatures of rinse, fix, and wash close to developer temperature.

Dry in a dust-free place.

Also, see pages 81 and 82.

DEFINITION

Graininess	Resolving Power	Sharpness	Degree of Enlargement Potential*
Extremely Fine	Extremely High	Extremely High	Extremely High

*The degree of enlargement usually will be limited by camera and subject conditions rather than by film characteristics.

Reciprocity Characteristics for KODAK Black-and-White Films for General Use*

Exposure Time in Seconds	Either: Increase Lens Opening by	Either: Or Use Corrected Exposure Time in Seconds	Change Developing Time by
1/100,000	+1 stop	Use lens opening correction	+20 percent
1/10,000	+½ stop	Use lens opening correction	+15 percent
1/1000	None	No change	+10 percent
1/100	None	No change	None
1/10	None	No change	None
1	+1 stop	2	−10 percent
10	+2 stops	50	−20 percent
100	+3 stops	1200	−30 percent

*This table does not apply to KODAK ROYAL-X Pan, Recording 2475, High Speed Infrared, and Technical Pan 2415 Films. For these films refer to the Data Sheet for each specific film.

Note: Make exposure corrections for long or short exposure times as indicated in the table. Make the development correction only if you want the whole roll of film processed for the corrected development time. If correcting the development is not practical because of significantly different exposure times used for different pictures on the roll, develop the film for the normal development time. Usually you can make the contrast correction for reciprocity effect by using higher or lower contrast photographic paper as necessary when you make the prints.

Selecting a KODAK Developer for Black-and-White Film—Key Properties

KODAK Developer

D-76 Long a favorite of pictorialists, it is well known for superior performance. This developer produces full emulsion speed and maximum shadow detail with normal contrast, and gives moderately fine grain. It produces a long density scale, and its excellent development latitude permits forced development with relatively low fog. If you want to use one developer for all types of roll film, we highly recommend KODAK Developer D-76. For greater sharpness, but with a slight sacrifice in graininess, you can dilute the developer 1:1. You can use KODAK Replenisher D-76R, sold by photo dealers, to extend the useful life of the developer. Instructions are included with the developer and the replenisher.

HC-110 A highly active developer for rapid processing of most black-and-white films. Photographic properties—such as sharpness, graininess, and shadow detail—are similar to those produced by KODAK Developer D-76. Both developer and replenisher are conveniently supplied in highly concentrated liquid form in plastic bottles which makes them easy to mix and use. Dilution A gives short development times; Dilution B is for longer development times which yield better development uniformity.

MICRODOL-X An excellent fine-grain developer which is designed to produce low graininess and high sharpness with minimum speed loss. This developer is particularly suited for developing small negatives intended for making big enlargements. It is clean-working and has a long life. You can obtain even greater image sharpness by using MICRODOL-X Developer diluted 1:3, but with a slight increase in graininess. You can purchase this developer in either powder or liquid form. A powder replenisher is also available to extend the developer's capacity.

POLYDOL A high-capacity developer designed for long life. You can use KODAK POLYDOL Developer as a general-purpose developer for both roll film and sheet film. It features good speed with medium grain, superior tonal-reproduction characteristics, and stable replenishment properties for consistent negative quality throughout its use. A replenisher is available for increasing the life of the developer.

DK-50 A popular general-purpose developer which works well with or without dilution. Moderately fast acting, it produces crisp, clean negatives with good highlight detail and medium grain. You can use KODAK Replenisher DK-50R to extend the capacity of the developer.

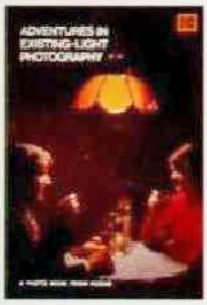
D-19 A high-capacity, rapid-working developer yielding brilliant, high-contrast negatives. It is especially suited to copying and technical applications where higher-than-normal contrast is required.

More Information

If you have questions about Kodak films that are not answered by this book, write to Eastman Kodak Company, Photo Information, Department 841, 343 State Street, Rochester, New York 14650. In foreign countries contact the normal source for Kodak products in that country.

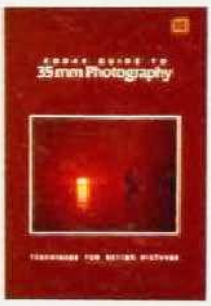
A large selection of Kodak books, including those described in this publication, is usually stocked and sold by photo dealers and bookstores. If your dealer cannot supply these books, you may order by title and code number from Eastman Kodak Company, Department 454, Rochester, New York 14650. The minimum order is $9.95. Please enclose your check or money order with the order, including $1.00 for handling plus your state and local sales taxes. Prices shown are suggested prices only and are subject to change without notice. Actual selling prices are determined by the dealer.

Adventures in Existing-Light Photography
AC-44, 80 pages
$4.00



Thoroughly covers the techniques for taking pictures under the existing lighting conditions for natural looking pictures. Tells what films to use for various subjects and lighting. Comprehensive exposure tables provide camera settings for many picture subjects. Filled with ideas and tips for better pictures.

KODAK Guide to 35 mm Photography
AC-95, 288 pages
$9.95

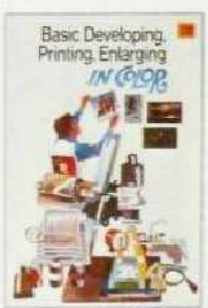


For the new 35 mm camera owner or for the more advanced photohobbyist who wants to brush up on the basics. Covers camera handling, Kodak films, exposure, daylight photography, flash, lenses, composition, action pictures, existing light, filters, and close-up photography. Includes hundreds of colorful pictures.

Filters and Lens Attachments for Black-and-White and Color Pictures
AB-1, 80 pages
$2.95

A book about filters—what they are, what they do, how they work, and how you can use them to improve your pictures or to obtain unusual and creative effects. Explains which filter will produce the effect you want and how to increase your exposure for the filter.

Basic Developing, Printing, Enlarging in Color
AE-13, 92 pages
$4.75



Specially prepared to help the photohobbyist process color film and make color prints in the home darkroom. The book has step-by-step diagrams, color pictures, tables, and easy-to-understand text. This is an excellent book for the do-it-yourself darkroom enthusiast.

Kodak has announced a new generation of self-teaching publications for photohobbyists called the *KODAK Workshop Series*. These are single-concept books written by renowned experts in an 8½ x 11-inch format with 96 pages each. Titles in the series include *Photographing with Automatic Cameras*, KW-11; *Electronic Flash*, KW-12; *Using Filters*, KW-13; *Building a Home Darkroom*, KW-14; *Black-and-White Darkroom Techniques*, KW-15; and *Color Printing Techniques*, KW-16, $8.95 each.

Remember to get a copy of the *KODAK Master Photoguide*, AR-21—40 pages, $8.50, described on page 89.

Picture on back cover
Gavin Brown, KINSA Award Winner

$5.50 U.S.A. **$7.00** CANADA

This book will acquaint you with the characteristics of Kodak films for general use. The book has two sections—a text portion and a section of Data Sheets at the end. The text portion explains what you'll want to know about selecting the right film, how to expose it properly, how to get it processed, and how you should store your films. The Data Sheet section gives you all the details for each film, such as film speeds, recommended filters, flash exposure guide numbers, and processing requirements. The information presented in this book will help you make photographs that you will be proud to show to your friends.

Eastman Kodak Company **Rochester, New York 14650**

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